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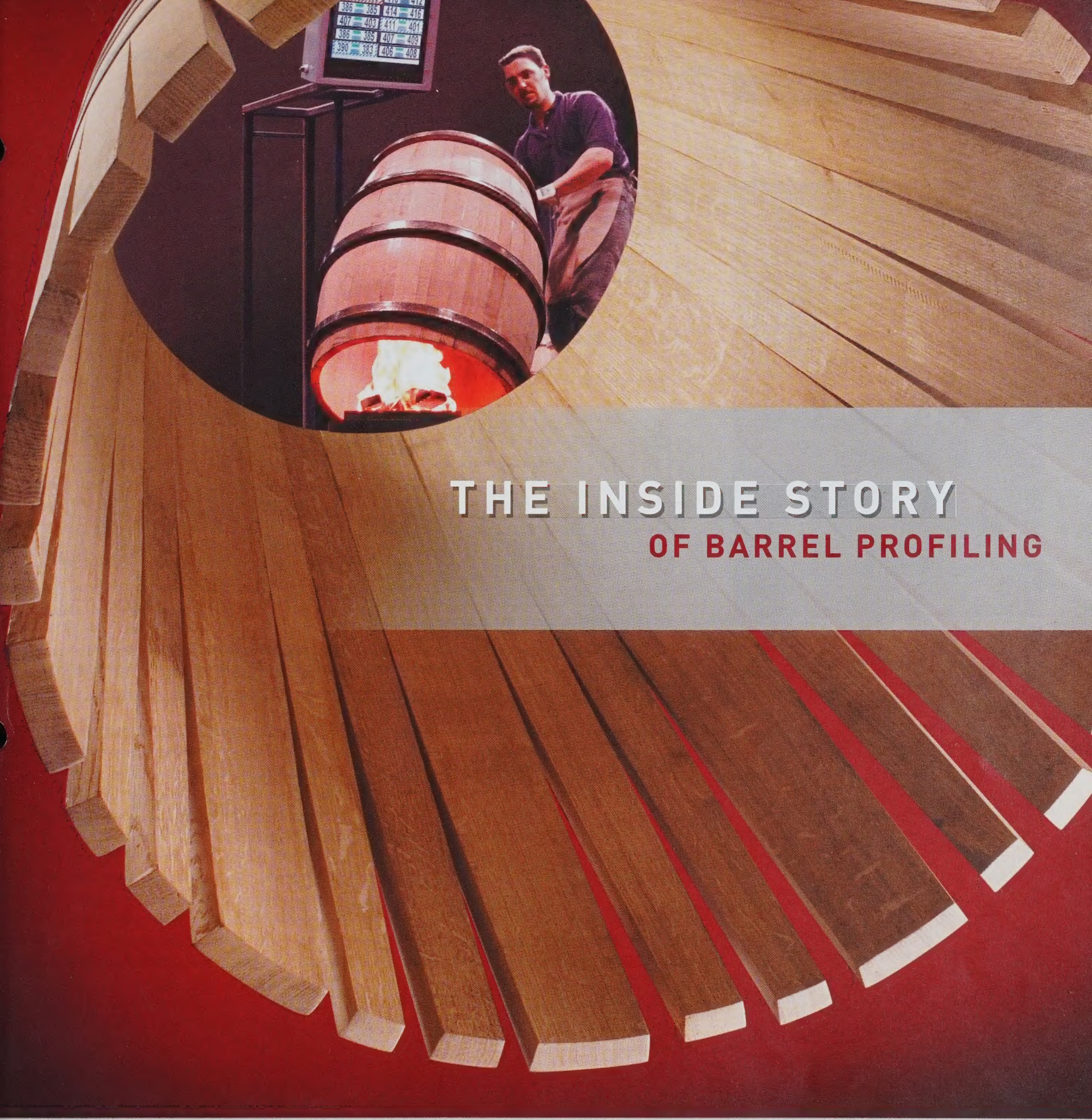

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Chemical and sensory profile of barrels heated by immersion prior to bending

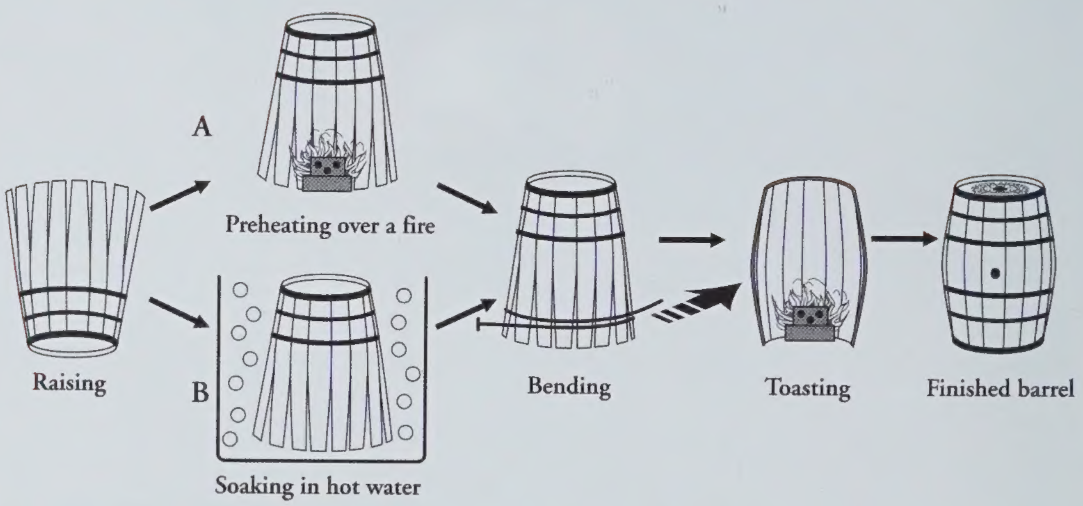

Photo (LEFT): Barrel immersion in hot water prior to bending. Figure 1 (ABOVE): Barrel production process. A - bending following heating over a fire; B - bending following heating by immersion.

BY Andrei Prida,[1]
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Barrel ageing is a key stage in producing great wines. Two major phenomena occur during barrel ageing: one consists of oxidation of certain substances in wines due to oxygen penetrating into the barrel and the other is the diffusion of extractable compounds from oak wood into the wine. These substances modify the wine's aromas and flavors, adding complexity and hints of "coconut," "toast," "vanilla" etc.[3]

Once the extractable compounds from the wood have been released into the wine, they may be modified by chemical and enzyme reactions.[7,9,10,11,2,4] Furthermore, the macromolecular structure of oak wood may absorb certain constituents from the wine.[1,8] These phenomena result in marked organoleptic changes in the wine.

PHOTO ABOVE: Volume in the water-immersion tank is changed every seven barrels, through continuous introduction of new water (de-chlorinated, filtered, and UV-sterilized), and removal of water charged with oak extractives. Each barrel spends less than one hour in the tank prior to fire-bending.

The complexity of barrel-ageing phenomena and their impact on wine quality make these containers valuable winemaking tools. Winemakers' objectives change to suit market tastes. The current trend in the winemaking world is to make barrel-aged wines with complex, fruity flavors, and relatively discreet oakiness. This trend is most marked among independent winegrowers, who want their wines to express their terroir, rather than any "universal" taste.[6]

Some coopers use immersion in hot water to prepare the raised (assembling of the staves in the shape of the barrel before staves are bent and heads are inserted) barrels for bending, but this process is much less widespread than traditional heating over a wood fire.

The immersion method consists of soaking raised barrels in hot water, then bending the staves rapidly to form the barrel before it is toasted. The only difference from the traditional process is that heating over a fire prior to bending is replaced by immersion in water, and then the process continues with toasting.

The first objective of this technique is to reduce stavewood breakage with water immersion before bending, to minimize the waste of broken oak staves occurring from bending following heating over an open fire.

However, this is by no means the most important aspect of the process. The adsorption of water by wood, extraction of wood components, and heat transfer in the wood-water system formed by immersing the barrel in hot water, then toasting wood with a high humidity level drive different kinetics in the production of compounds from toasting and degradation of wood compounds over fire from those that occur after traditional fire bending prior to toasting.

It is noteworthy that during traditional fire toasting coopers spray some water on the inside of the barrel in order to prepare the barrel for bending. However, contrary to water immersion, this operation does not allow any significant changes in wood composition, the moisture content remaining stable.

Wines aged in barrels where the staves have been bent following hot water immersion are empirically perceived to be less marked by oaky aromas. However, to date, very little scientific data was available concerning the impact of this bending technique on wood/wine exchanges, thus making it impossible to explain the sensory differences noted in empirical observations.

This report presents the results of a two-year comparative study of the two stave bending techniques, focusing on the sensory profiles of wines aged in the different types of barrels and their concentrations of volatile molecules.

MATERIAL AND METHODS

Barrel production

The barrels were made by Tonnellerie Seguin Moreau (Seguin Moreau Burgundy ZAC du Pré Fleury les Creusottes Nord, Chagny, France) using staves bent either following immersion or by heating over a fire (see Figure 1). All barrels were produced from one batch of French fine grain oak.

Table I: Design of experiment

WINE #	GEOGRAPHICAL ORIGIN	VINTAGE, WHEN PUT INTO BARREL	GRAPE VARIETY	ANALYSES (AGEING TIME, MONTHS)
1	Burgundy	2007, before AF	Chardonnay	3 - sens. (panel 1) + chem. 6 - sens. (panel 1 / panel 2) 12 - sens. (panel 1)
2	Burgundy	2007, before MLF	Pinot Noir	3 - sens. (panel 1) + chem. 6 - sens. (panel 1 / panel 2)
3	Burgundy	2007, before MLF	Pinot Noir	3 - sens. (panel 1 / panel 2) + chem. 6 - sens. (panel 1) 12 - sens. (panel 1)
4	Southwest France	2007, after MLF	Merlot/Tannat	6 - sens. (panel 1) 9 - sens. (panel 1) + chem. 12 - sens. (panel 1)
5	Bordeaux	2008, before AF	Sémillon	9 - sens. (panel 1) + chem.
6	Rhône Valley	2008, before MLF	Grenache	7 - sens. (panel 1) + chem.
7	Rhône Valley	2008, before MLF	Mourvèdre	7 - sens. (panel 1) + chem.
8	Burgundy	2008, before AF	Chardonnay	6 - sens. (panel 1/panel 2) + chem.
9	Burgundy	2008, before MLF	Pinot Noir	6 - sens. (panel 1) + chem.

Key: sens. = sensory analysis; chem. = chemical analysis; AF = alcoholic fermentation, MLF = malolactic fermentation.

In the "traditional process," raised barrels are preheated (A) for 10 to 15 minutes to a temperature of 100° to 120°C to soften the wood fibers and make them pliable. This process does not cause any major production of compounds arising from toasting; indeed, any modifications are insignifi-

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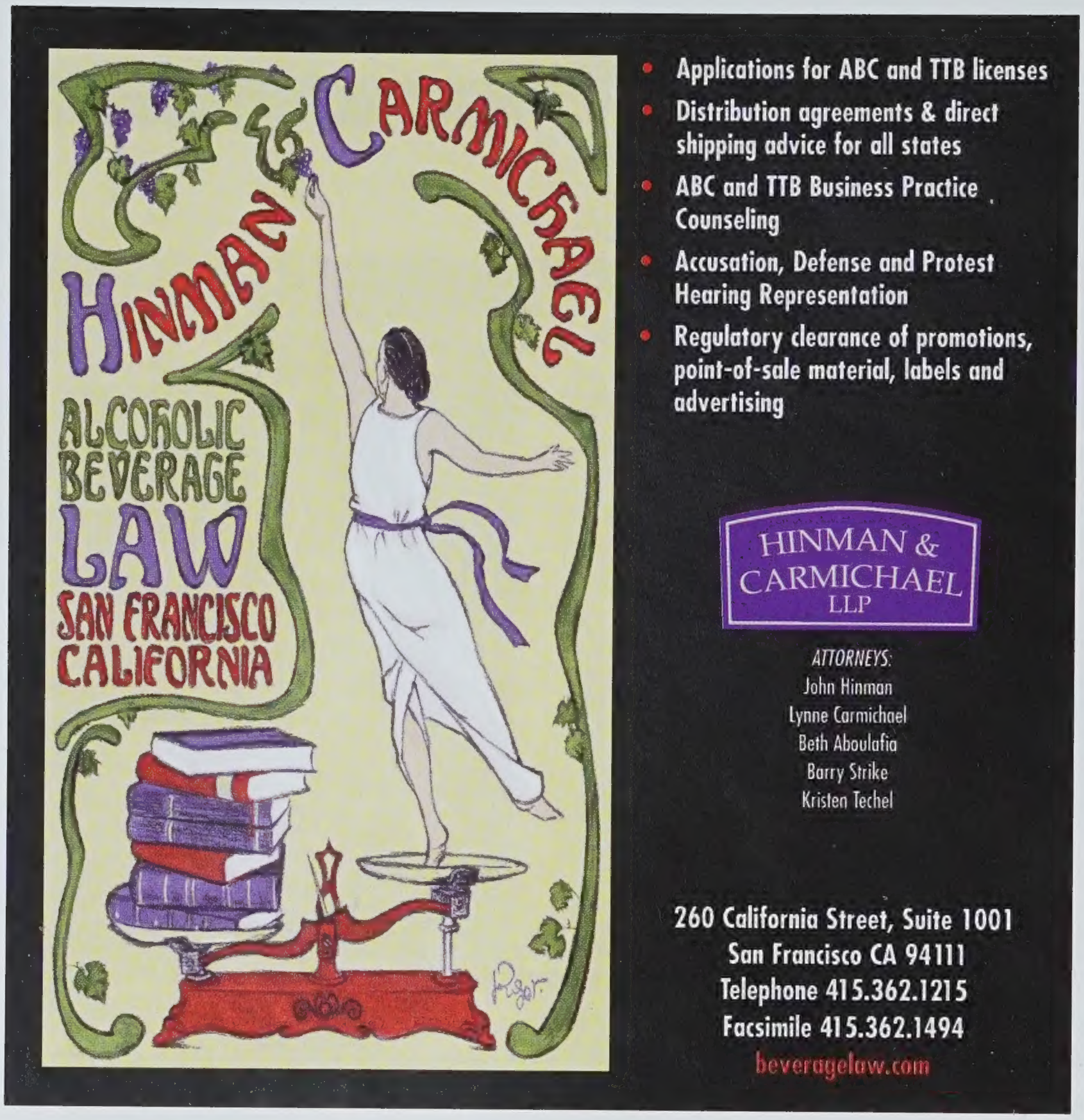

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Table II: Sensory results

Wine #	Ageing time, month, Panel*	Comparison of heating by immersion to heating over fire
1	3	Toasty⊖, Bitter⊖
	6	Oaky⊖, Toasty⊖, Spicy⊖, Structure⊕
	6 (panel 2)	Toasty⊖, Acidity⊖, Fruity⊕
	12	Fruity⊕, Oaky⊖, Toasty⊖, Acidity⊕, Tannic⊖, Structure⊖
2	3	Fruity⊕
	6	Sawdust⊖, Vanilla⊕, Acidity⊖
	6 (panel 2)	Oaky⊖, Sawdust⊖, Structure⊕
3	3	Acidity⊕
	3 (panel 2)	Toasty⊖, Fruity⊕, Vanilla⊕
	6	Oaky⊕, Length⊖
	12	Oaky⊖, Bitter⊕
4	6	Tannic⊕, Vanilla⊕
	9	Fruity⊕, Acidity⊕
	12	Fruity⊕, Oaky⊖, Sawdust⊖, Toasty⊖, Tannic⊕
5	9	Toasty⊖, Acidity⊖
6	7	Oaky⊖, Toasty⊖, Sawdust⊖, Length⊖, Structure⊖
7	7	Oaky⊖, Toasty⊖, Bitter⊖, Acidity⊖
8	6	Oaky⊖, Toasty⊖, Tannic⊖
	6 (panel 2)	Oaky⊖, Toasty⊖
9	6	Oaky⊖, Toasty⊖, Fruity⊕, Tannic⊖

Key: * = panel 1 by default. "⊕" = intensity of the descriptor was higher following heating by immersion; "⊖" = intensity of the descriptor was higher for the traditional process.

cant compared to those that occur during the toasting stage.

In the process employing bending by "immersion," the preheating stage (A) is replaced by soaking in hot water (B). The temperature of the water does not exceed 100°C; production of toasting products due to heating are negligible.

Toasting – The heating process that causes chemical modifications in the wood was performed according to the standard "medium-long" protocol used in the cooperage. This stage was

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And they now have extensive scientific data on the process and how the end result barrels are less marked by oaky aromas. Due to the staves' high humidity, the physical and chemical transformations during the "bousinage" toasting differ significantly.

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identical, irrespective of the type of bending process: heating over a fire or by immersion.

Wines

Trials occurred on nine sites with nine wines (three white wines and six red wines) from two different vintages: 2007/2008 (Table I). Wines were either barrel-fermented or put into barrel before or after malolactic fermentation. There were three barrels in each wine lot.

Sensory analysis

Sensory analysis by a tasting panel of Seguin Moreau staff (panel I of 8 to 14 persons), and a trained panel of enology students from the Institut Universitaire de la Vigne et du Vin (panel II of 16 to 18 persons), was done at regular intervals, as described in Table I.

Table III: Descriptors where the intensity varied between the control and immersion techniques, with the associated probabilities

Technique	Descriptor	Number of uses of each descriptor	Probability
Fire bending	**Oaky**	**10**	**1.1×10^{-8}**
	Fruity	0	n.s.
	Sawdust	**4**	**0.016**
	Vanilla	0	n.s.
	Toasty	**12**	**2.1×10^{-11}**
	Spicy	1	n.s.
	Acidity	**4**	**0.016**
	Bitter	2	n.s.
	Tannic	3	n.s.
	Structure	2	n.s.
	Length	2	n.s.
Water immersion	Oaky	1	n.s.
	Fruity	**7**	**3.4×10^{-5}**
	Sawdust	0	n.s.
	Vanilla	3	n.s.
	Toasty	0	n.s.
	Spicy	0	n.s.
	Acidity	3	n.s.
	Bitter	1	n.s.
	Tannic	2	n.s.
	Structure	2	n.s.
	Length	0	n.s.

n.s. > 0.05; Bold type = probabilities below 0.05.

Panelists performed blind quantitative descriptive analysis using a standard list of descriptors including six odor (overall oaky, fruity, sawdust, vanilla, toasty, spicy) and five taste descriptors (acidity, bitterness, tannic intensity, structure, length). The sensory sessions

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were organized by series with the same wine aged in fire-bent and immersion/fire-bent barrels. The order of presentation was arbitrary and different for different panelists to obtain more objective data.

The tasting sessions were conducted in tasting rooms following the usual practices in wine tasting and were conducted by a session observer. Before the sensory analysis, the bottle was tasted in order to look for possible off-flavors and was rejected if there was an abnormal odor.

Panel members awarded 0 to 10 points according to the intensity of each descriptor (0 – very weak, 10 – very strong).

The values given by each taster were normalized using the average value for that taster over the entire series. The Independent Student's T-test was applied to the normalized values to identify the descriptors for which there was a variation in intensity between the barrels made using "immersion" and the "traditional process."

Only those descriptors showing differences with a probability below 5% were retained for further processing.

Analysis of volatile compounds

The following 19 odoriferous volatile molecules from oak wood were assayed in the wines using GC-MS:[3]

- furan and pyran compounds (furfural, 5-hydroxymethyl-furfural, 5-methyl-furfural, furfuryl alcohol, maltol, and ethyl maltol) – class of compounds characterized by toasty and butterscotch odors in pure state;
- aromatic aldehydes (vanillin and syringaldehyde) – class of compounds characterized by vanilla/woody odors in pure state;
- volatile phenols (guaiacol, 4-methyl-guaiacol, eugenol, isoeugenol, o-cresol, m-cresol, phenol, syringol, and allylsyringol) – class of compounds characterized by smoky, phenol and spicy odors in pure state;
- lactones (trans- and cis-whisky-lactones) – class of compounds characterized by coconut and woody odors in pure state.

Under the reducing conditions in wine, furfural tends to be converted into furfural alcohol, so the "total

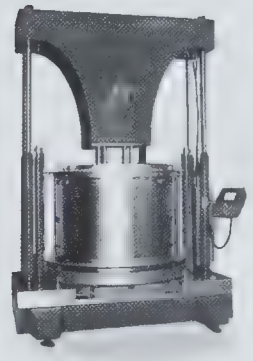

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Table IV: Student's tests for paired samples

AGEING	DIFFERENCES BETWEEN CONCENTRATIONS IN WINES AGED IN BARRELS PRODUCED BY FIRE TOASTING VS HEATING BY IMMERSION		SIGNIFICANCE
	AVERAGE DIFFERENCE, ⊠ g/L	STANDARD DEVIATION, ⊠ g/L	
furfural	**361**	**650**	**0.049**
5-methyl furfural	**100**	**99**	**0.002**
furfuryl alcohol	**3589**	**3352**	**0.001**
guaiacol	**5**	**9**	**0.050**
trans-WL	-15	38	n.s.
cis-WL	-36	54	0.022
maltol	**27**	**18**	**5.0 x 10-5**
4-methyl-guaiacol	**4**	**3**	**1 x 10-5**
phenol	-1	7	n.s.
ethyl-maltol	1	2	n.s.
o-cresol	0	1	n.s.
m-cresol	0	1	n.s.
eugenol	-4	8	n.s.
isoeugenol	**6**	**10**	**0.046**
syringol	**21**	**25**	**0.005**
5HMF	**352**	**434**	**0.007**
allylsyringol	**8**	**12**	**0.017**
vanillin	**26**	**42**	**0.029**
syringaldehyde	**170**	**272**	**0.030**
total furfural	**3950**	**3933**	**0.002**

Key: positive values indicate that concentrations were higher following preheating over fire, and negative values that they were higher following heating by immersion. n.s. > 0.05; bold type = probabilities below 0.05.

furfural" content was calculated (combined concentrations of furfural and furfural alcohol).

These analyses were carried out at regular intervals, as shown in Table 1.

Preliminary studies had revealed that the wine matrix (variety, wine composition, and use of barrel such as presence of lees, oxygen, etc.) played an important role in determining the concentration of substances extracted from the oak.[5] Consequently, it was not possible to apply the standard Student's T-test to assess the difference in impact between the "traditional" and "immersion" processes.

The Student's T-test for paired samples (immersion compared to traditional process) was used. The difference between the concentration of molecules released by oak wood in the two types of barrels was calculated for each type of wine. This test, to determine whether the average of these differences was significantly different from 0, consisted of comparing pairs of samples taken from the same wines aged in barrels produced by bending following immersion and the traditional process.

RESULTS

Sensory analysis of wines

Descriptors with significant differences in intensity (risk threshold less than 5%) are presented in Table II. The "+" sign indicates that the intensity of the descriptor was higher following heating by immersion and the "-" sign that it was higher in the control (fire bending).

One can observe a lack of agreement between panels I and II for wine-1, 2, 3, for some common descriptors found (toasty for wine -1 and sawdust for wine -2). The only wine where students and staff had similar findings was Wine-8. This fact shows the different perception of sensory differences between wines analysed by each panel. That is why the analysis of all of the study data is required in order to establish a common and rigorous conclusion.

Certain descriptors were used very frequently in different tasting sessions to describe various wines. This led to the assumption that heating by immersion produced systematic differences compared to the controls, irrespective of the type of wine or the period when it was tasted by the tasting panel.

To verify this hypothesis, the probability of the significant differences for each descriptor used for all the wines studied were calculated, assuming that the probability that the significant differences for each descriptor given in a specific case (wine X tasting) was 5%, to reflect the risk threshold of 5% chosen for the sensory analyses. The other assumption was the independence of the events (tasting sessions). The results are in Table III.

Table III shows the frequency of use of descriptors where intensities were higher:

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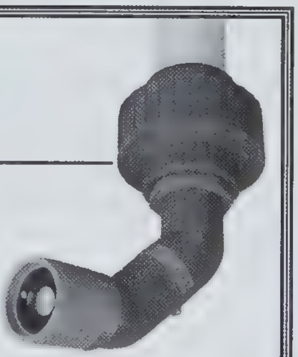

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- for fire bending (fire bending line)
- for water bending (water bending line).

For example, the occurrence of oaky descriptors in both parts of Table III means that the oaky descriptor was significantly more intense for traditional process in 10 tasting sessions during the entire study, whereas it was more intense for water-immersion in one tasting session. The probability calculated reveals that 10 uses for the first case is an indicator of systematic difference, while one single use for the second case is not.

Analysis of these results revealed that the main differences concerned the olfactory descriptors. The "toasty" and "oaky" descriptors were significantly more intense when the raised barrel was preheated over a fire compared to heating by immersion. The other marked difference was that the intensity of the "fruity" descriptor was significantly higher following preheating by immersion.

Differences with a lower confidence level were observed for the "sawdust" and "acidity" descriptors, with slightly higher intensity for "sawdust" after traditional heating.

In contrast, the "acidity" descriptor was also apparently significantly more intense following preheating by immersion in a certain number of sensory analyses. Thus, on the basis of the findings presented in this article, it was not possible to draw any systematic conclusion concerning the difference in intensity of this descriptor, as the results depended on the type of "wine matrix" and the length of ageing time, rather than the bending process used.

There was no significant difference between the intensity of the other descriptors, especially those describing flavors.

Chemical analysis

Table IV shows the Student's T-test results for paired samples (preheating by immersion compared to fire). They include the main differences of concentration of each compound between wine aged in traditional fire-bent barrel and paired wine which was aged in barrel preheated in water before bending. Thus the values of differences could be positive and negative. A positive difference indicates that a higher amount of chemicals is found from the traditional process, whereas a negative difference from water immersion before bending.

Table IV includes the standard deviations of differences between samples and values of paired samples T- test in order to check whether distribution of differences is different from 0. The low T-test p values means that the difference is systematic across all pairs. Such values are presented in bold characters in Table IV.

These results revealed that ageing wines in barrels made by the traditional process resulted in wines with higher concentrations of com-

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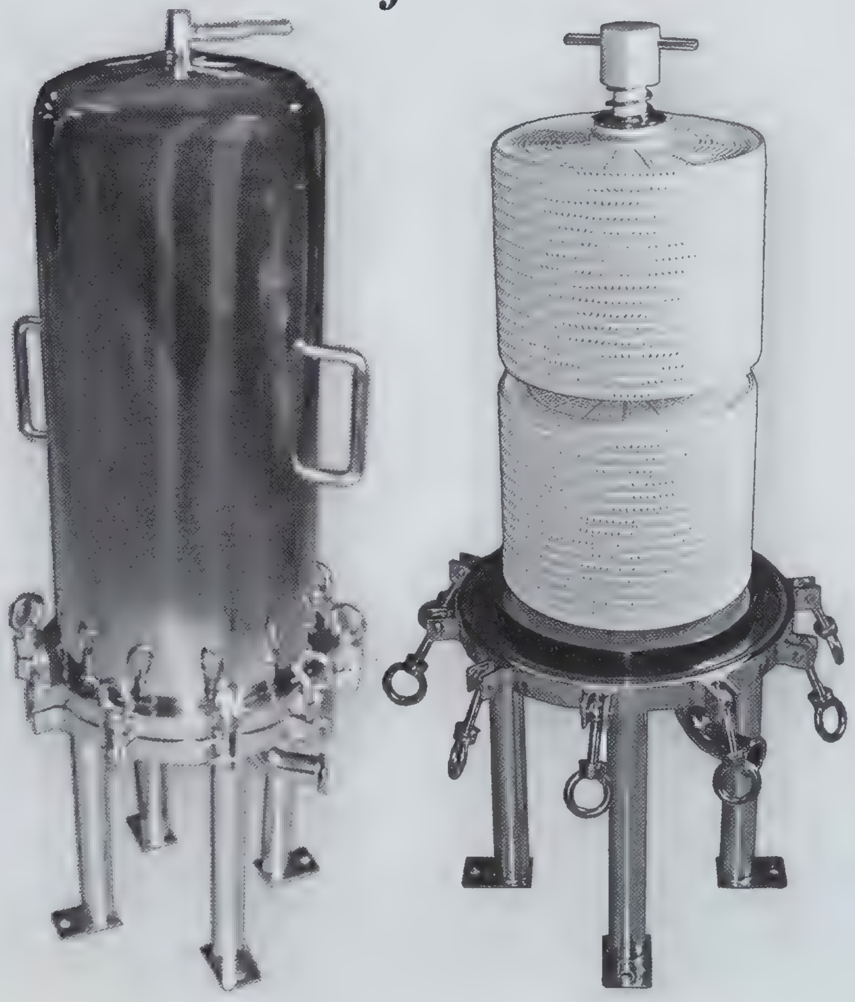

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pounds produced by heating/toasting, particularly furan compounds (furfural, 5-hydroxymethyl-furfural, 5-methyl-furfural), volatile phenols (guaiacol, 4-methyl-guaiacol, isoeugenol, and allylsyringol), aromatic aldehydes (vanillin and syringaldehyde), and maltol.

In contrast, wines aged in barrels heated by immersion had higher cis-whisky-lactone content.

Conclusions

Analyses of the volatile compounds in the wines confirmed that the main differences between the two processes concerned the concentrations of toasting compounds produced by heat/toasting: furan compounds, volatile phenols, and aromatic aldehydes. Wines aged in barrels made by the traditional process had higher concentrations of these compounds. On an olfactory level, wines aged in barrels heated by immersion exhibited less intense "oaky," "toasty" and, to a lesser extent, "sawdust" aromas. Tasters also found these wines "fruitier."

Analysis confirmed that the main differences between the two processes concerned the concentrations of toasting compounds. As we shown previously, the production of toasting compounds is an improbable process during the preheating stage (prior to bending) because of low temperature irrespective for fire or water process. That is why the possible explanation of difference consists in the different moisture content, which was higher for water immersion. The evaporation of additional water in the latter case decreases the quantity of calories transmitted to wood during toasting. This "loss of energy" reduces the degree of degradation of wood hemicelluloses and lignin and the production of respectively furan and pyran compounds and aromatic aldehydes and volatile phenols.

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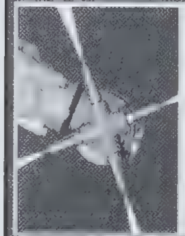
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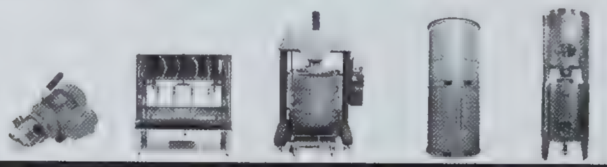

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Acknowledgements

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WHOLESALERS FAIL TO TELL WHOLE TRUTH

BY Angela Logomasini,
Director of Risk & Environmental Policy,
Competitive Enterprise Institute,
Washington, D.C.

Among the "fictions" allegedly being perpetrated by opponents of the new bill HR 5034 is one that reads, "Fiction: This bill will 'overturn' the 2005 Granholm decision." A new public relations website — HR5034.org — hosted by the National Beer Wholesalers Association (NBWA), — addresses this issue and a number of other alleged "fictions" they claim are perpetrated by bill opponents.

This assertion strikes out at wineries and other producers who argue that HR 5034 would essentially override the decision in the *Granholm v. Heald*. That case invalidated discriminatory state laws that banned direct-shipping from wineries outside the state, while allowing in-state wineries to ship.

Wendell Lee, (General Counsel of the Wine Institute), expressed such concerns in *Wine and Spirits Daily*: "The scope of the bill [HR 5034] gives to the states the power to pass laws that totally disregard the Commerce Clause or federal statutes," he notes. Yet the NBWA website says, "[O]nly the Supreme Court itself or a constitutional amendment can 'overturn' a Supreme Court decision."

Commerce Clause

NBWA's claim is highly misleading. Under the Constitution's Commerce Clause, congressional action can override certain Supreme Court rulings. The Commerce Clause of the U.S. Constitution grants Congress the power "to regulate commerce ... among the several states." How that applies depends on whether Congress is silent on an issue or addresses it in legislation.

If Congress is silent, the court applies a legal doctrine known as the "dormant commerce clause." It bars state laws that directly or indirectly apply differential legal treatment to in-state and out-of-state entities.

There are some limited exceptions. For example, states can pass laws that impact commerce if they can demonstrate that the law has "a legitimate purpose" (such as protecting public health) that it could not meet "in a less restrictive way." [i] For example, in 1986, the Supreme Court allowed the state of Maine to ban imports of live fishing bait because of the potential to introduce new parasites into the state fisheries. [ii]

Granholm was decided on the basis of congressional silence. Accordingly, the Supreme Court held that states may not impose laws that apply "differential treatment of in-state and out-of-state economic interests that benefits the former and burdens the latter," unless the state could not meet its purpose in a less restrictive way.

Overriding Granholm

HR 5034 would break Congressional "silence." Section 3(b) explicitly states: "Silence on the part of Congress shall not be construed to impose any barrier under clause 3 of section 8 of article I of the Constitution (commonly referred to as the 'Commerce Clause') to the regulation by a State or territory of alcoholic beverages. However, State or territorial regulations may not facially discriminate, without justification, against out-of-state producers of alcoholic beverages in favor of in-state producers."

The second sentence appears to provide some protection for Granholm, but Section 3(c) of the bill sets standards that essentially make all state regulations justifiable. It also would have directed the courts to assume that all state alcohol laws are valid, demanding challengers prove otherwise. Had this version passed, it would have become impossible to challenge any state alcohol law in court.

But the language was so blatantly anti-competitive that the bill's sponsor, Rep. Bill Delahunt (D-Mass.), offered a more modest draft for full Judiciary Committee consideration on September 29. It removed provisions shifting the burden of proof to challengers of state laws and the unlimited justifications for state action.

Yet it maintained the provision breaking congressional silence, changing only the second sentence in Section 3(b) to read: "However, state or territorial regulations may not intentionally or facially discriminate, against out-of-state or out-of-territory producers of alcoholic beverages in favor of in-state producers or in-territory producers unless the State or territory can demonstrate that the challenged law advances a legitimate local purpose that cannot be adequately served by reasonable nondiscrminatory alternatives."

This version appears much less problematic and in line with Granholm. Except, it only applies to producers and it appears to validate state laws that are indirectly or allegedly "unintentionally" discriminatory. Courts would then have to decide how to apply this new standard.

Policy implications

Both versions of HR 5034 are designed to empower wholesalers to buck deregulatory trends within the industry to ensure their governmentally secured-middleman role. Specifically, the legislation is designed to help states win cases defending anti-competitive laws that are currently being argued before federal courts and to encourage state legislatures to impose additional regulations.

"Direct-to-consumer shipments will never drive a wholesaler out of business, but the deregulation it is fostering will," noted Craig Wolf of the Wine and Spirit Wholesalers of America in 2007. [iii]

Indeed, wholesalers recognize that Granholm has advanced a deregulatory trend. For example, Richard Mendelson, wine lawyer and author of *From Demon to Darling: A Legal History of Wine in America*, notes: "Within two and half years of Granholm, eleven states had leveled up, and none had leveled down completely … Those states had to open their borders to all direct shipping or close them entirely."

Tom Wark of the Specialty Wine Retailers Association has noted that the new version of HR 5034 will open the door to a host of directly discriminatory state regulations focused on non-producers – retailers, importers, and even small wholesalers. In fact, the bill represents the wholesalers' attempt to stymie trends that could apply Granholm's standards to retailers – eventually allowing direct shipping between wineries and retailers, cutting wholesalers out completely in some cases.

Retailers are currently fighting for such freedoms in federal courts — cases that HR 5034 could essentially bring to a halt. A ballot initiative in Washington State — advanced by the nation's largest wine retailer, COSTCO — could break the entire government-mandated three-tier system in that state, which is another trend wholesalers want to contain.

In addition to curbing freedoms for retailers, the new draft could also bolster state laws that indirectly discriminate against wineries and other producers by allowing allegedly indirect, "unintentional" discriminatory effects.

Specifically, such provisions may validate state laws applying volume caps. For example, Massachusetts imposed caps that only allowed producers of 30,000 gallons or less of wine to ship direct. Yet all wineries in the state fell below that limit, applying shipping bans to out-of state wineries. A federal circuit court ruled that law unconstitutional in January 2010, but it is not clear how the courts will rule new draft language of HR 5034, and the issue is being debated in other states.

Wholesalers may offer other variations of similar underhanded policies that serve their special interests at the expense of other players. If they do not succeed, expect them to offer yet more legislation to continually chip away until they get what they want.

Prospects for passage

Prospects for the passage of HR 5034 appeared to be low before Delahunt offered his compromise proposal. Key House and Senate leaders — such as the House Speaker, and vineyard owner, Nancy Pelosi (D-Calif.) — were likely prevent a floor vote on a standalone bill. Yet leadership positions change, which may occur after the 2010 elections. Compromise language could also reduce opposition.

In any case, this bill could become law without ever gaining "standalone" consideration either in a lame duck session or in the next congress. This one would more likely become law as an amendment to "must-pass legislation," incorporated without much notice or as a trade-off among members. This risk is higher in the Senate, where lawmakers routinely offer controversial legislation as amendments, even legislation that was never considered in committee.

Not surprisingly, lawmakers in California are concerned about the potential passage of HR 5034. The California Assembly passed a joint resolution (SJR 34) — sponsored by Sen. Pat Wiggins (D-Santa Rosa) and Senator Alex Padilla (D-Pacoima) — opposing the bill this summer. It was delivered to the President and Vice President, all members of the California delegation in Congress, and congressional leaders.

Apparently wholesalers think victory is possible, as they continue to invest and build momentum. As of September 30, 2010, they have garnered 151 cosponsors in 37 states — constituting 32% of the House of Representatives. They have no plans to back off, nor should their opponents. ■

Angela Logomasini has a Ph.D. in politics and is a Senior Fellow at the Competitive Enterprise Institute and has blogs at both winepolicy.com and weeklywinepick.com.

Footnotes

i: *City of Philadelphia v. New Jersey* (1978), http://supreme.justia.com/us/437/617

ii: *Maine v. Taylor* (1986), http://supreme.justia.com/us/477/131.

iii: Amy Cortese, "Grapes in Chains," *The American*, January/February 2007, http://www.american.com/archive/2007/january-february-magazine-contents/0116-grapes-in-chains.

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OAK INSERTS

Grain orientation effect on extraction of oak flavor compounds

BY Kevin Crawford, Almon Benton,
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Properly aged and toasted oak, sourced from the proper species and growing climate, imparts desirable flavor characteristics to wine when used in the traditional fire-toasted barrels. The chemical composition of oak is variable depending on species, and ageing and toasting conditions.[1]

In modern winemaking, barrel alternatives provide a form which can be toasted in convection ovens, a reproducible method for imparting oak flavor compounds to a wine compared to expensive and small capacity barrels. Barrel alternatives also provide an opportunity for higher surface area exposure to a wine, resulting in more rapid extraction of oak flavor.

Extraction of flavor compounds from oak into wine is a time-dependent process. In a traditional 60-gallon barrel, the wine is exposed only to the parallel (vertical) grain of the oak (one side of the stave exposed to wine). All flavor extraction must occur from this surface. A wine might spend several months in barrel and the barrel will still retain enough flavor compounds to be extracted in additional fills.

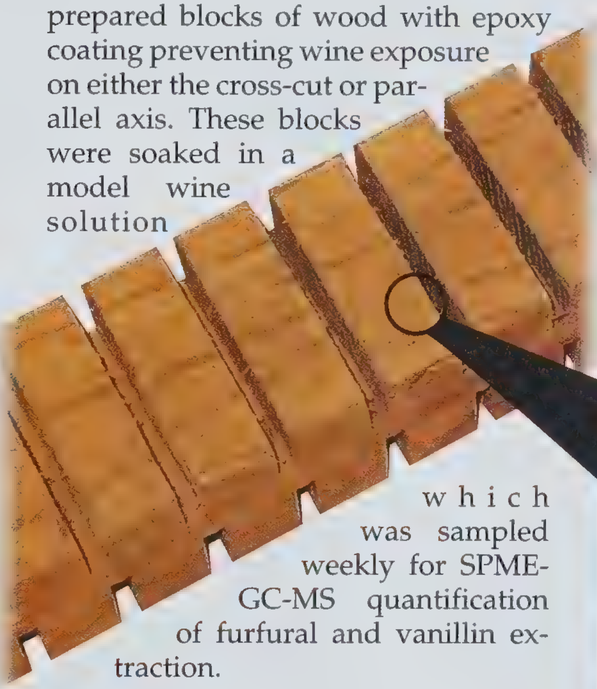
In contrast, barrel alternatives are submerged in a wine, providing exposure on both the parallel and cross-cut axes on all sides of the oak. Not only is more surface area exposed to the wine, but more importantly, two of these surfaces consist of the cross-cut axis of the wood grain. When barrel alternatives are used, the entire piece of wood is exposed to the wine, allowing penetration and extraction along the cross-cut axes and parallel axes.

In order to determine the relative extraction rates of oak flavor compounds based on grain orientation, we prepared blocks of wood with epoxy coating preventing wine exposure on either the cross-cut or parallel axis. These blocks were soaked in a model wine solution which was sampled weekly for SPME-GC-MS quantification of furfural and vanillin extraction.

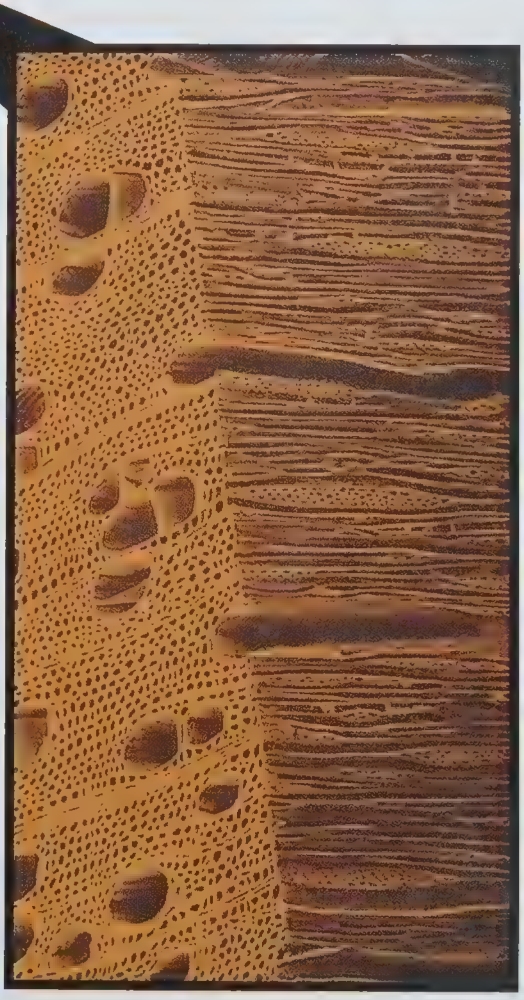
Our results indicate that furfural is rapidly extracted from the cross-cut axis relative to the parallel axis and that extraction of vanillin was only measurable from the cross-cut axis exposed wood during the twelve-week exposure. These results demonstrate that maximal exposure of the cross-cut axis of oak pieces will result in a much more rapid extraction of flavor compounds into wine.

Solid Phase MicroExtraction – Gas Chromatography – Mass Spectrometry (SPME-GC-MS) is the preferred method in labs around the world to quantify desirable and undesirable flavor and odor compounds in wine.[2,3,4] This method extracts and concentrates the flavor compounds (SPME) followed by separation (GC) and identification/quantification of the compounds (MS). It also involves much less manual sample preparation than the traditional liquid-liquid extraction and concentration techniques.

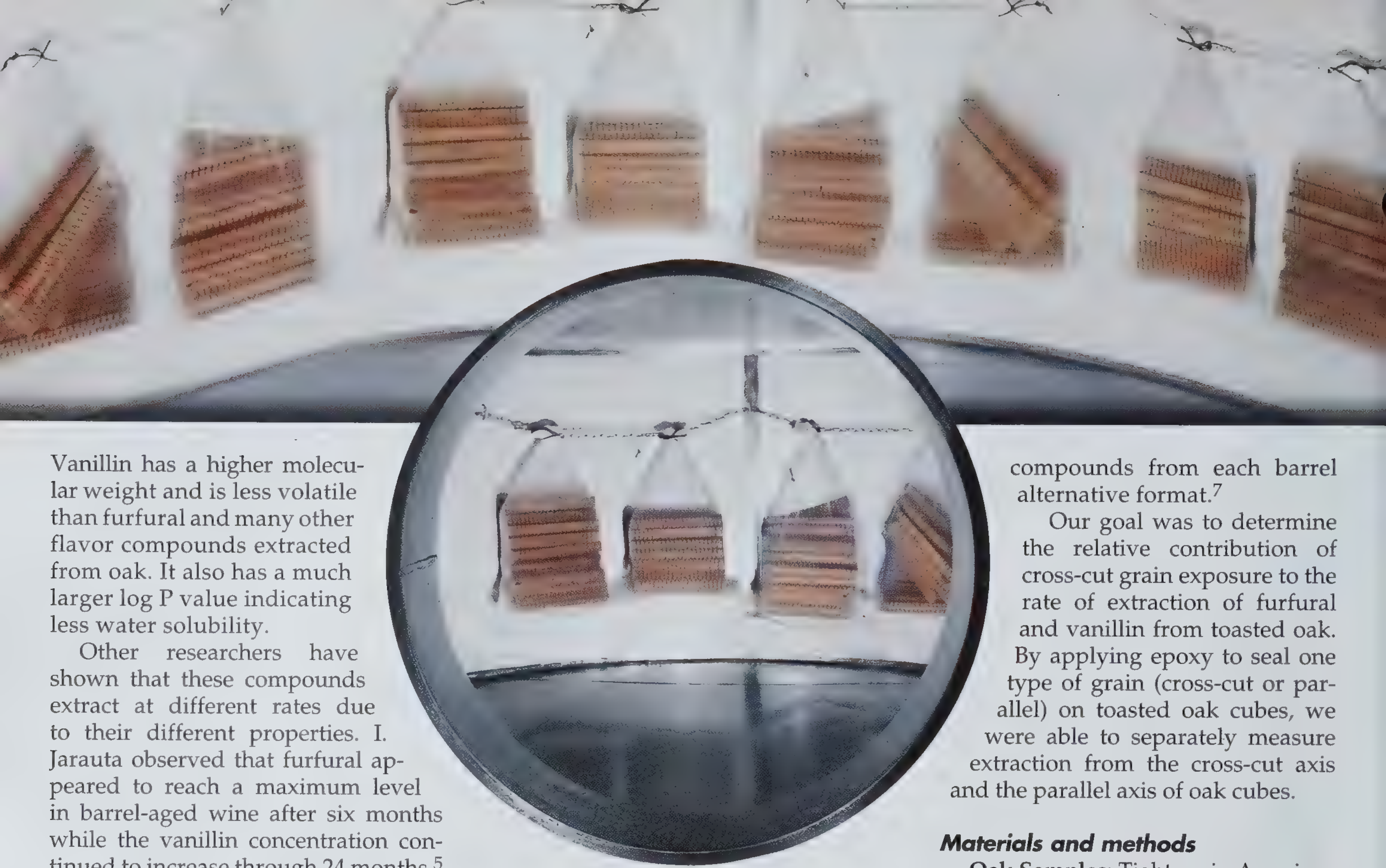
Vanillin and furfural are two desirable flavor compounds present in toasted oak (see Figure 1.) Furfural is the smaller of the two compounds and is more volatile than most other flavor compounds present in oak. It also has a low octanol-water partition coefficient (log P) indicating high water solubility. Furfural and similar compounds are responsible for a sweet and butterscotch flavor in wine.



ABOVE: Cross-cut stave insert is 12.5 inches long, with notches 1/2-inch wide and one-inch deep. Surface area created by notches increases rate of wine penetration, accelerating extraction of flavor compounds.



RIGHT: Microscopic photo (courtesy S.U.N.Y.) shows difference between cross grain (notch) and parallel (vertical) grain (the predominant surface of conventional tank staves and barrel inserts). Xylem vessels on cross-cut surface (large holes) allow water in a living tree to flow up. Parallel surface is the same as stave surface exposed to wine inside of barrel.



Nylon mesh bags containing 36 Fine Northern Oak cross-cut staves hang from a chain hung around the circumference inside a fermentation tank waiting for Chardonnay juice to extract oak flavor into the wine during primary fermentation.

Vanillin has a higher molecular weight and is less volatile than furfural and many other flavor compounds extracted from oak. It also has a much larger log P value indicating less water solubility.

Other researchers have shown that these compounds extract at different rates due to their different properties. I. Jarauta observed that furfural appeared to reach a maximum level in barrel-aged wine after six months while the vanillin concentration continued to increase through 24 months.[5] P.J. Spillman detected increasing vanillin through 23 months in barrel-aged red and white wines.[6]

The format of the barrel alternative can also impact the rate of extraction of flavor compounds. M. Cano-Lopez demonstrated that tasters could detect differences in finished wine exposed to different formats of barrel alternatives such as powder, shavings, and cubes, with the effect being most pronounced after six months, indicating a different rate of release of flavor compounds from each barrel alternative format.[7]

Our goal was to determine the relative contribution of cross-cut grain exposure to the rate of extraction of furfural and vanillin from toasted oak. By applying epoxy to seal one type of grain (cross-cut or parallel) on toasted oak cubes, we were able to separately measure extraction from the cross-cut axis and the parallel axis of oak cubes.

Materials and methods

Oak Samples: Tight grain American white oak (*Quercus alba*) heartwood was obtained from the Staggemeyer Stave Mill (Caledonia, Minnesota). The oak was quarter-sawn to the conventional 1 ¼-inch thick barrel stave and seasoned for two years.

Sample Preparation: Oak staves were toasted throughout using an extended toast protocol, then cut into cubes (1.25 x 1.25 x 4.0 cm). Cross-cut exposed cubes

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were covered with epoxy on the parallel axis (four sides) while parallel exposed cubes were covered with epoxy on the cross-cut axis (two sides). The resultant surface area exposed was 40 cm^2 for the cross-cut exposed sample and 52 cm^2 for the parallel-exposed sample. The cubes were weighed before the epoxy was applied to ensure an equal mass of oak was used in each extraction.

Two extraction flasks were prepared with 13.26 g of oak (one with all cross-cut exposed pieces the other with all radial-exposed pieces) in each flask and 1,326 ml of 13% ethanol in deionized water solution. Two extraction flasks were prepared with 13.26 g of oak (one with all cross-cut exposed pieces the other with all radial-exposed pieces) in each flask and 1,326 ml of 13% ethanol in deionized water solution. (Note that 10 g/L of extracted oak flavor is more than used in typical winemaking blends. Usually a tank with such a concentration is blended with unoaked wine to achieve the wine's intended style for bottling.)

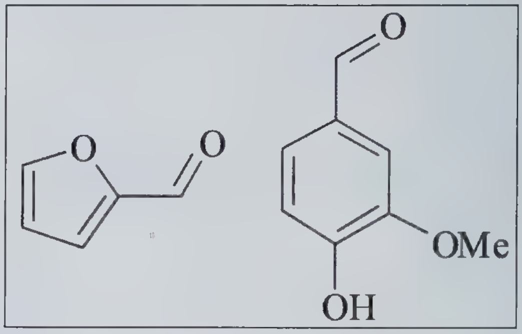

Figure 1: Structures of furfural (left), and vanillin. Furfural molecular weight = 96.08 g/mol, log P = 0.46. Vanillin molecular weight = 152.15 g/mol, log P = 1.21.

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After each week, five 10-ml aliquots were removed from each flask and prepared for SPME-GC-MS analysis. The cross-cut exposed sample solution reached a maximum furfural concentration after two weeks; the solution was removed and replaced with a fresh extraction solution after the week-5 sample was collected.

Quantification: Furfural was quantified against an internal standard with comparison to a calibration curve. Vanillin was quantified in the same way using a second internal standard for comparison. In our method, the lower limit for detection (LOD) of furfural and vanillin was 100 µg/L.

RESULTS

Furfural

Figure 2 is a graph of the concentration of furfural in the ethanol/wine mixture over time for both parallel exposed and cross-cut exposed samples. The concentration of the solution containing the cross-cut exposed cubes reached a maximum after only two weeks of exposure (1,139±40 µg/L). The extraction solution was then removed after week-5 in order to test whether additional furfural would be extracted. The graph demonstrates that the furfural concentration did not grow to the same level as the first extraction, achieving only

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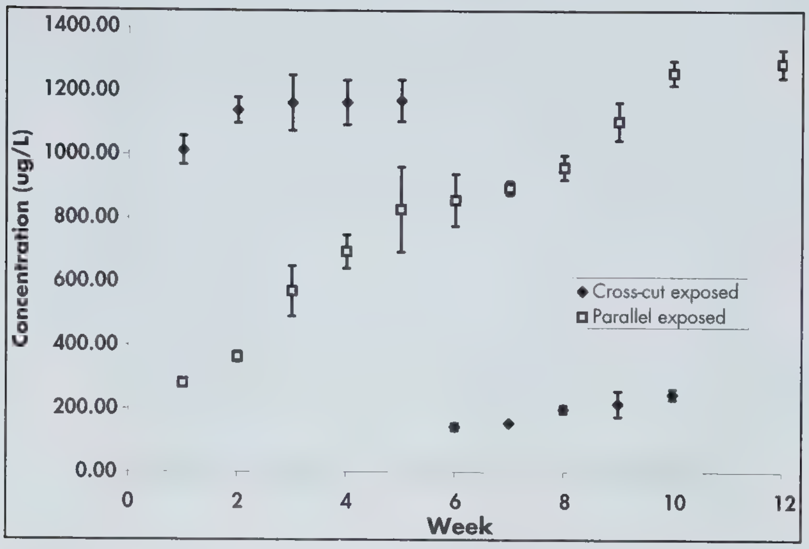

Figure 2: Time course of furfural extraction from cross-cut and parallel-exposed wood. The cross-cut exposure extraction solution was changed after removing the fifth sample.

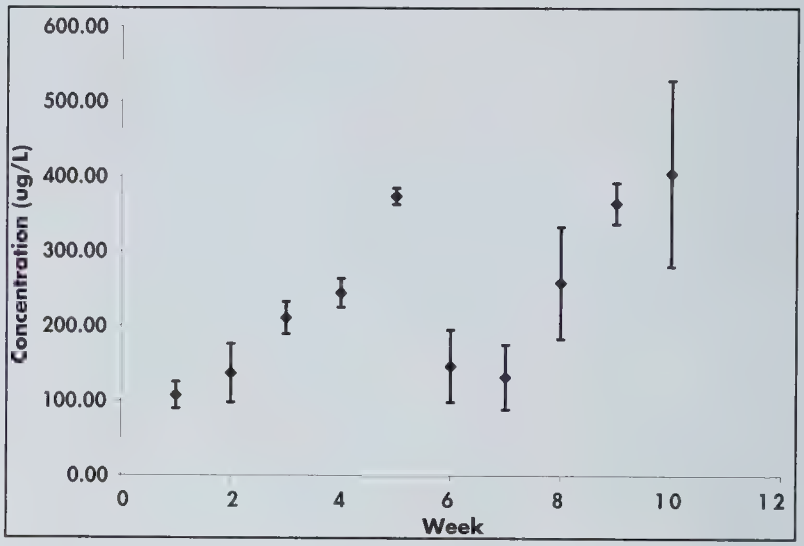

Figure 3: Time course of vanillin extraction from cross-cut exposed wood. Extraction solution was changed after removing the fifth sample.

245±17 μg/L after an additional five weeks of extraction.

The parallel exposed sample solution however continued to increase in furfural concentration over the entire ten-week period. Because it was not clear if the concentration had reached a maximum level, one additional set of aliquots was withdrawn from the cross-cut exposed flask after the twelfth week (included on the graph). This sample showed a concentration very similar to the ten-week sample (1,257±38 μg/L at 10 weeks, 1,286±44 μg/L at 12 weeks).

The results demonstrate that furfural is completely extracted from cross-cut exposed oak in approximately two weeks while more than ten weeks is required for extraction of furfural from parallel exposed oak. This result is significant considering that the relative

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Oak inserts added to wine tanks at Fetzer Vineyards

Fine Northern Oak (FNO) inserts have been used by Fetzer Vineyards (Hopland, CA), for more than four vintages. "We use FNO inserts (medium toast) in Cabernet Sauvignon and Merlot," says Mike Chupp (red winemaker), "between four and eight months – the average is six months – in tanks ranging from 15,000 to 30,000 gallon capacity.

"We anchor nylon mesh bags containing 36, 12.5-inch long inserts each to a chain about three feet above the tank floor, and then fill the tank with wine, allowing the bags of inserts to float in the bottom quarter of the tank. 250 inserts are used in a 15,000 gallon tank. The tank full of wine is sparged with nitrogen monthly to mix the tank. Micro-ox is also occurring while the FNO insert bags are in the tank. The wine temperature is between 58° and 65°F.

"A tank of wine aged with FNO bags of inserts plus micro-ox may end up to be about 10% of a bottling blend," concludes Chupp.

"We have used FNO medium toast inserts in tank (9,250-gallon capacity) fermentation of Chardonnay for two vintages," adds Charlie Gilmore (white winemaker). "We ferment with the staves suspended 36 to 48 inches above the tank floor to keep the inserts out of the yeast lees. We put one insert per nine gallons of wine into the fermentor. The inserts remain in the fermentation tank for three to six months with the lees.

"We mix the wine on yeast lees post-fermentation with a pool sweep tygon tube about once per week. We do remove lees from some tanks. We also return some lees to the tanks to achieve different solids levels. Sometimes we return different lees to a Chardonnay tank."

"FNO gives us the toasty, sweet oak spice components that enhance the flavor and aroma characteristics of Fetzer wine blends and complements our style," adds Dennis Martin, Director of Winemaking, Brown-Forman Wines.

Fetzer Vineyards uses nylon-mesh bags containing barrel alternatives in tank ageing of red wine and Chardonnay fermentation including: Fine Northern Oak cross-cut staves, Innerstave Fan Systems, Nadalie Oak Add Ins™, Oak Solutions Group's ēvOAK tank staves, and Stavin Stave Segments. "We continually evaluate barrel alternatives to determine what will work best for Fetzer consistentcy with the style and quality of our winemaking," concludes Martin.

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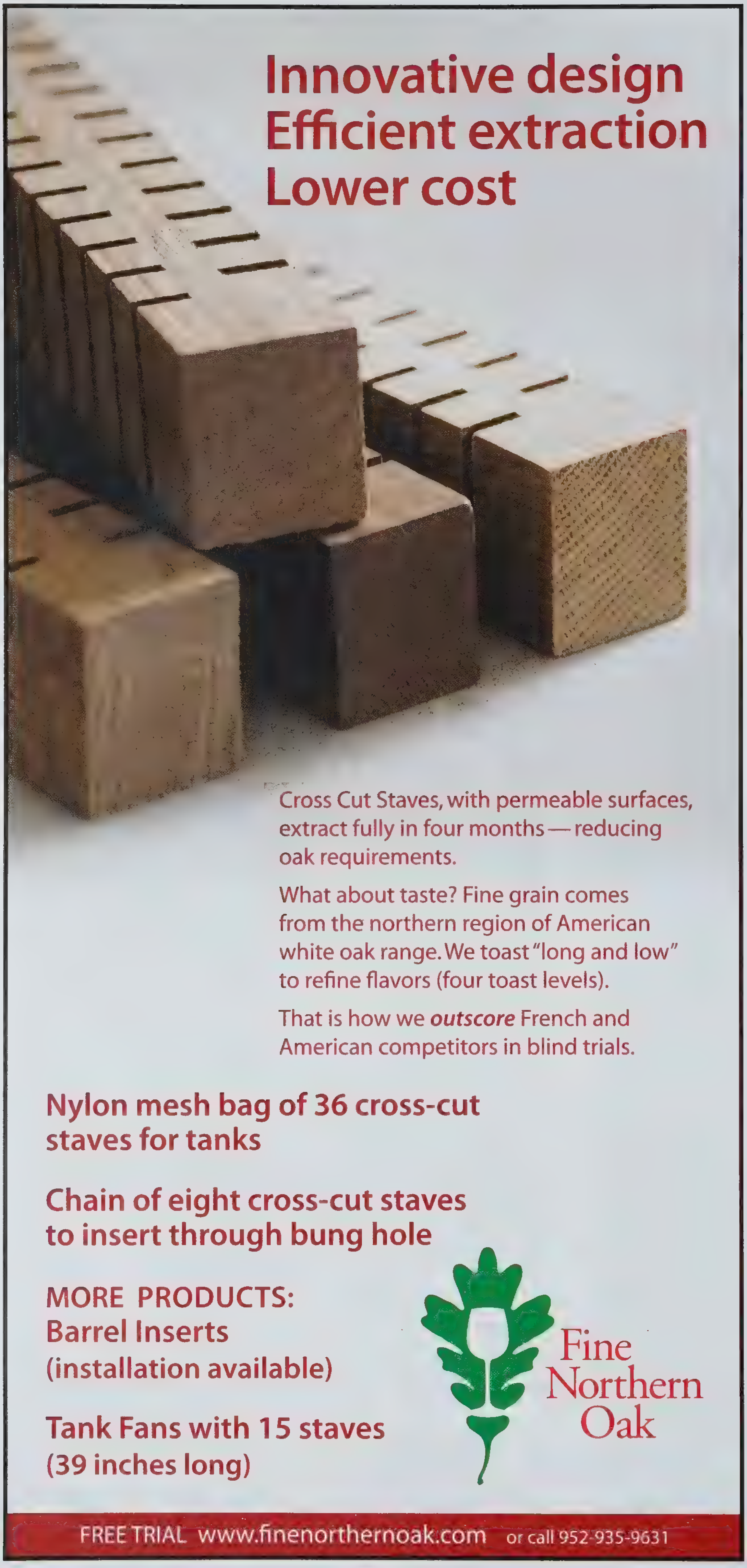

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surface area of the parallel exposed oak is greater than the cross-cut exposed oak (52 cm^2 compared to 40 cm^2). We therefore conclude that the extraction of furfural from the cross-cut axis of oak occurs at a rate at least five times greater than extraction from the parallel axis.

Vanillin

Figure 3 is a graph of the concentration of vanillin in the extraction solution over a ten week-experiment. Only the cross-cut exposed sample is plotted as the parallel-exposed flask had no measurable vanillin (less than 100 μg/L) during the course of the entire experiment. The longitudinal-exposed sample showed an increasing vanillin concentration through the first five weeks at which point the extraction solution was changed (due to the complete extraction of furfural as mentioned above).

The vanillin concentration did achieve approximately the same level in the second extraction solution as it reached in the first. The slope of the vanillin graph is also similar in both five-week extractions. The vanillin results demonstrate that this compound is extracted much more readily from cross-cut exposed oak than from parallel-exposed oak.

Comparison of furfural and vanillin

Furfural extracted more rapidly than vanillin from both cross-cut exposed and parallel exposed wood. Furfural is both a smaller molecule and more water-soluble than vanillin which could explain some of the difference in extraction rates between these two compounds rather than any differences in distribution through the wood.

It is important to note that furfural extraction from cross-cut exposed wood was complete after about two weeks while vanillin continued increasing through the fifth week and was also extracted into the second solution. This effect indicates that re-use of oak alternatives would result in different flavor profiles due to the differences in extraction rates for these two compounds.

For example, a five-week exposure of the cross-cut exposed oak to a wine solution would result in about 1,200 μg/L of furfural and almost 400 μg/L of vanillin in the wine after first use. Upon

Continued on page 49

2010 WINE INDUSTRY CEO SURVEY

RESPONDING TO TRENDS IN A DIFFICULT MARKET

**BY Robert Smiley, PhD,
Director of Wine Studies,
Dean of Management, Emeritus,
University of California, Davis
Michael Thomas, Graduate Research
Assistant**

Among the 28 participants in the 2010 trends survey compiled by the Wine Industry Financial Symposium Group® and the U.C. Davis Graduate School of Management, CEOs of 21 wineries, four distributors, two grape growers, and one bulk wine broker took part. Each survey question is followed by a summary of participants' answers.

Q Have your wine sales begun to revive? For which wines at which price points?

• Our wine company is in a unique position. We are fortunate to have a lot of brands at entry level and also brands that are very heavily skewed to retail. Those brands continue to perform very well. One of our brands in particular, as mature as it is and as long as it has been around, had an enormous year — a record year, primarily driven by Chardonnay, Muscato, and Pinot Grigio.

• At the low-end, Muscato is the variety that stands out. There is not enough Muscato right now in California to feed the beast. It is a sweet wine, similar to our Pinot Grigio at the lower end. Every producer that can is ramping it up right now.

• We cannot sell Chardonnay or Merlot. Sauvignon Blanc is selling pretty well. It is not just the cheap stuff that is selling; some of the high-priced stuff that has a real pedigree is selling too.

• We have seen some strong growth with some of our luxury brands, which are priced at $25 and above. But you have to temper that with a year-to-year comparison because last year was such a tough year for anything above $25. Part of the sales increase is natural organic growth and part of it is that we are putting more emphasis in that area and obtaining the appropriate response in the marketplace.

• Sales have dropped; more so in our brands priced over $10, which are off about 10% or so. Our brands that are slightly under $10 are probably off about 5%. The ones that are $6 are probably flat. These figures are all relative to last year.

• Overall, everyone is somewhat confident that we are hitting bottom. Nobody really sees it getting worse. However, there is some debate on whether we are truly recovering and if so at what speed and at what expense. We have certainly been out there supporting a lot of products. We are really seeing a lift on the luxury side because we have discounted, and consumers do recognize a value.

• At least within our portfolio, I truly think we are seeing a resurgence out there around the country. Sales have returned to their 2007 levels and profits are just shy of that. We are not complaining about profits this year. However, we have not returned to 2007 profit levels because discounting cuts into the bottom line.

• In our tasting room business in Napa, the consumer traffic is back up over last year, but the average ring is down pretty significantly, approximately 20%.

• Our sales started to suffer at the end of the 2008 calendar year. We knew that we were not going to be any different from anyone else. We elected to begin by-the-glass programs aggressively in order to keep volume pace moving along. We were able to do that successfully. If you look at where we stand now (10 months into our fiscal year), we are going to have a record year in volume but we are not going to make very much profit.

Summary

❦ Although consumers may not be drinking the same wine that they were two years ago, people are still drinking wine. ❦ Overall, sales are up but profits are down; mostly from discounting. ❦ Consumers do recognize a value and have responded well to discounting. ❦ The brands that have a strong pedigree have **some** pricing power. The brands without a strong track record are seeing a permanent price correction. ❦ Pinot Noir, Cabernet Sauvignon, and Chardonnay continue to be the strongest wines in sales and demand.

Q Do you think sales of your higher-priced wines will ever return to their 2007 levels? When?

• I personally believe there is going to be a permanent re-pricing of wine. There will be some brands like Harlan or Dominus that will continue to maintain "darling status," much like the first growths do in Bordeaux. The first growths of California, popular wines, will hold. But I do not think that everybody is going to sell their wines for $100 per bottle. It is just too much.

Cabernet is too costly compared to what you can buy Bordeaux for, especially with the cheaper Euro. Bordeaux in the second, third, or fourth growths can be purchased at very attractive prices relative to California Cabernet. People have gotten used to high prices, not only for Cabernet but also Pinot Noir, but

WINE INDUSTRY
SYMPOSIUM

there is not a lot of fire from $50 to $70 Pinot Noir or $75 to $100 Cabernet. It has got to be something special.

- We have lost a lot of customers among the traders and investment bankers. These were the guys who were buying the wine. So many have lost their jobs, I think we have lost one-third of the buyers.

- Napa Valley wines are in a completely new competitive landscape with wines from every other wine-producing region in the world. I think we are in a very precarious place on demand, sales, and profitability.

- The luxury market category got too big and collapsed under its own weight. It was all tied to an irrational economy. Vintners were just jumping in because the water was warm and it looked like money was growing on trees. It seemed all you had to do was market a bottle of wine with an attractive label that said Napa Valley Cabernet and it could sell for $50 to $60.

- It will definitely return, but the question is when. It seems we have shifted from aspirational buyers to value buyers, who have found that there are some very good wines at reasonable prices. I do not want to imply that pricing has been unreasonable. I think the return is going to be slow but I am sure it is going to return, in either two or four years but somewhere in that range. I do not think we have created a recession-era type of buyers. Our parents still see it like that, but I don't think so.

- We will get back to 2007 levels in probably two more years. However, while we will be able to get there volume-wise, it is probably going to take us longer to back off on programming — maybe three or four years to get back to 2007, when we had virtually no programming dollars. The basis of this estimate is the consumer confidence index.

- I am very bullish that those days will come back. However, if we look at wine purchases as part of fine dining, the upswing is probably three to four years out.

- We will get back there, but grape growing/winemaking is probably one of the poorest managed businesses I have been involved with. Nobody seems to forward-plan for a product that takes four years from getting in the ground to production and once the winery buys it, three years to get the finished product to market. Everybody seems to base all of their decisions on the current year. We have had this boom-or-bust theme. I suspect that within three to five years from the start of the economic slowdown in 2007, we will have another boom period.

- We will eventually get back to those pre-slowdown levels on the sales and price side, but I think it is going to be a ten-year run to get them back there, not a three- to four-year run.

- Over $50 per bottle will take at least 10 years to come back. We have

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had a fundamental shift and I had originally thought it was a 10-year shift, but now I am wondering if it might be a 30-year shift.

SUMMARY

❦ The luxury market became overweight and irrational. ❦ We saw a big switch from "aspirational buyers" to "value buyers." ❦ The jobs that fueled a large chunk of the demand for higher-priced wine are lost forever. ❦ In order for wineries and grape growers to prosper, they need to forward-plan better for future demand and not use current consumer demand as their only proxy for decision making. ❦ Many respondents believe that volumes will return in one to two years, but profits will lag behind two to three years or more.

Q *Have the difficulties of the last three years caused any long-term strategic changes?*

- We do business with 25% fewer wine suppliers than we did three years ago across the enterprise. We have truly focused on the people who are the most meaningful to our company and we have not actively pursued new suppliers across our enterprise. I would say that we have trimmed our tail and we will continue to trim our tail. I think we will probably do business with another 10% to 20% fewer suppliers over the next three years than we are doing business with today.
- We are looking at any/everything that we can do to reduce labor and increase mechanization in our vineyards. Another big issue is immigration reform.
- Last year we decided, very strategically, to cut our production in half and sell other wine on the bulk market. We had taken a loss, so we rebuilt the strategic plan, and it is a lot more conservative.
- Retailers have discovered that they want to control their own brand. They end up branding the store rather than the wine brand. I would say, on average, U.S. retailers have 7% to 10% private label, which are brands that we make for them but they are exclusive. Then you have Trader Joe's which is probably 50%. But you also have a lot of major retailers who say I want to be in the 20% to 30% range. Our view is there is quite a bit of growth there.
- The general overall strategic plan has stayed the same. We are definitely firm believers that the consumer is trading up and we are in a "premiumization" strategy. It has definitely made us slow down in aggressiveness in that area but our general strategy is to continue to drive and produce in that upper end — in the super premium, ultra premium, and luxury side of the portfolio.
- Yes and no. The difference is we downsized and we stayed downsized; we are not adding people back. That is very different. We are looking at ways to increase our business without adding a lot more infrastructure, which has led me, for a long time, to be on the

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leading edge of the social media stuff and using technology.

- It is the same blocking and tackling. We now blog and tweet and do Facebook. We are into the new social networking and different forms of communication to reach the new consumer.
- We have not cut our people, or any winemakers, and we are still making our traditional wines. We are not introducing wine-in-a-box or adding oak chips to any of our wines. We are either growing our own grapes or buying from friends and neighbors the same way. We are not skimping on production costs. We have not tried to acquire more brands to get larger. We have not changed how we sell our wines or distribute our wines. We are just sort of staying the course.

SUMMARY

❦ Many growers, wineries, and distributors are doing business with fewer counter-parties. They are looking to build upon and foster the key relationships that they already have.

❦ Businesses that are well positioned to expand are doing so, as there are buying opportunities out there. Others are strategically looking for new price points and markets to compete in. Most respondents are not actively filling lost positions. They are doing more with less and using technology to assist. Those that are positioned to hire are seeing a robust pool of potential employees.

❦ Nearly every winery respondent is using some form of social media, both to stay connected with their customers and to drive direct-to-consumer sales.

Q *Has the consolidation in production and distribution caused any major difficulties?*

- There is going to be more strategic alignment, at least among the big wineries, which have to do a little more declaring and establish bigger strategy relationships with the major wholesalers. They may still have some small guys out there; those relationships will probably go away.
- We have been migrating to larger distributers because our brand has been growing and we see that some small to mid-size distributers really cannot service a chain as well as a big distributorship.
- We are limiting the amount of grapes that we will sell to a particular winery.
- You used to deal with decision makers, and now you deal with a wine buyer who cannot make a decision so it is very difficult. You say, "Let's make a deal," and they cannot make a deal.
- These guys just have way too much to sell. I think consolidation is a terrible threat for almost any winery. I do not even think Diageo feels like they get enough mind share.
- The answer is yes, in terms that it creates a more competitive environment. In

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many of these consolidations, if you have brought in a large wine company like a Diageo or a Constellation, they now want their own sales group within a wholesaler. What can happen is that the people who have been selling your wine for years are now in another group and are not allowed to sell your wine anymore, so you have a whole bunch of new people even though you have been in the same wine house for 20 years. The new people do not know about you, so you have to rebuild relationships.

• During the last three years we have been hiring and building our sales and marketing team, especially at the field level. Many other suppliers have been reducing their work force, so the pool of potential employees is quite deep right now. The quality is as high as I have ever seen it.

• Consolidation at the distributor level has not had a big impact on our winery, but consolidation at the retail level has caused problems. If you take someone like Landry's and suddenly you have one buyer controlling 200-something units, you have less diversity; you are either in or out.

SUMMARY

❦ Most respondents believe consolidation, whether it be among distributors, suppliers, or retailers, will continue to some extent or another. ❦ Consolidation can have both positive and negative effects. ❦ One of the biggest concerns for suppliers is losing mind share and shelf space as their distributors consolidate. ❦ Some respondents believe that distributor consolidation will open up new opportunities for niche distributors who cater to higher-end brands.

Q *What do you think will be the hottest issues over the next five to ten years?*

• One of the things that will be interesting to watch is the privatization issue in Washington state.

• We have to be very aware of indus-

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try pressure groups, such as the anti-alcohol lobby and those who want ignition-lock devices in automobiles. If we lose those battles, we lose our rights to operate.

In addition, the Green Movement and the whole carbon footprint issue and what that means to the wine industry will start to become more profound. I think it is going to have an impact on packaging — glass is not exactly a low carbon footprint product. It is also going to affect our farming practices — it is going to be harder domestically to develop virgin land.

- Water in the North Coast and northern interior of California is going to be a big issue — not only quantity but quality. In 2010, we had a bit of a reprieve because we had more than normal rainfall, but regulations often cause growers to make difficult choices. For instance, if you pump water from North Coast rivers to frost-protect, you face the possibility of fish kills.
- I think it would have to be taxes and water. Taxes, both at the state and national level, are going to be the biggest problem. Take a look at England, that is what is going to happen here. They are strongly taxed there.
- Water rights will be a huge issue. Also, we seem to be getting more exotic pests every year in California. In just the last six years, we have gotten the European Grapevine Moth, Light Brown Apple Moth, and Vine Mealybug. Devastating diseases, too, seem to appearing at a more rapid pace.
- In Napa Valley, a big issue is choosing which rootstocks to plant. We still have a lot to learn.
- On the consumer front, I am very hopeful. Demographics are destiny, and the 75 million millennial demographic group is jumping into wine — especially premium wine, both imported and domestic. My theory is that the Starbucks generation learned about flavor and "regionality" when it came to coffee. Now they are making the leap from coffee to wine and that is very good for the industry.
- In five to ten years the millennials will be consuming. They will be in their thirties and we will definitely be talking about them.
- I think people are going to start to understand and appreciate appellation-specific wines. They will start to get that you cannot replicate in the Central Valley or the North Coast what you can find in Burgundy or Bordeaux, or Cabernets from Napa and Sonoma. I think this notion of sense of place and site-specific identities is catching on here.
- Grape supply is going to be a challenge for the industry. We are definitely heading for a shortage. It is tough for growers to get funding to plant, and no one is planting on spec.
- We are going to go into a bit of a supply shortage in California, which I think is going to be taken up by bringing in more imports rather than by a lot of additional planting.

This continued globalization of wine consumption in the U.S. is going to be an interesting challenge for domestic producers. It will be difficult for domestic suppliers to grow because the supply is simply not there — there is not enough non-bearing acreage in the ground. Also, domestic producers typically have a higher Cost of Goods compared to Argentina, Chile, and Australia. I would not be surprised to see a little bit of protectionism start to hit the scene for the domestic market.

- We are trending toward more and more imports, which I think is going to be our biggest challenge. Consumers are accepting them, and large wineries that are getting increased market share are now becoming world-shoppers for the lowest price.
- Given the amount of production overseas, we are going to be under assault as domestic producers. We could lose another 10% to 15% to imports.
- My big fear is that the U.S. will resemble the U.K. more than it does today. There, four main retailers control about 90% of the wine that is sold at retail. That is not good for anyone, especially consumers, because it does not provide them with a breadth of choice. It also tends to drive margins down, which means there is less money to invest in new land, product development, and new wineries.
- I think there is going to be a continued challenge to the three-tier system, not by suppliers, but by large retailers like Costco. You are going to see continued consolidation within the distribution business. As the spirit companies continue to get bigger, they will continue to force more distributer consolidation.
- Ongoing issues with the distribution system will continue. I think we will see a radical change, where distributors end up not even shipping wine — that will be outsourced.
- Distribution is really an un-American type business. Distributors, who are losing margins and volumes as the whole industry is in turmoil, are lobbying for legislation to preserve their business. I see these efforts growing. HR 5034 is an example of what is to come — more of the evil that we as vintners don't like.

SUMMARY

❦ Wineries are concerned about the pending bills in Congress. Direct to consumer sales remain to be a highly profitable side of the business and in some instances the sole catalyst for sales of some of the higher-end wines. ❦ Many believe taxes have only one place to go — up! ❦ Although water is not an issue for most wineries this year, it will continue to be an issue in the future. ❦ Many respondents eagerly await the onslaught of the millennial generation, as the bulk of them will enter the wine drinking market in the next five to ten years. ❦ Even though many respondents believe we are in for a shortage of domestic grapes, the lower cost of imported grapes threatens the profitability of new plantings. ❦ Wineries are concerned about the pending bills in Congress. Direct-to-consumer sales are a highly profitable side of the business and in some instances the sole catalyst for sales of some of the higher-end wines. ■

Welcome to the 21st Century, TTB

Although reincarnated from the Bureau of Alcohol, Tobacco, and Firearms (ATF) under the provision of the Homeland Security Act in 2003, the "new" TTB is still administering archaic wine label regulations established in the 1930s. It is time for the TTB (Alcohol and Tobacco Tax and Trade Bureau) to join the 21st Century.

The fortified wine segment of the American wine industry is primarily concerned with the antiquated regulations prohibiting the use of terms such as "fortified" and "grape (or wine) spirits added" on wine labels.

It may come as a bit of a surprise to the TTB, but the United States is a far different place than when the "Noble Experiment" of Prohibition was repealed in 1933. The U.S. has developed into one of the premier wine producers in the world, and Americans are among the most educated and informed wine consumers.

Granted, prior the enactment of the 18th Amendment some domestic wine producers would "fortify" often poor-quality table wines by adding distilled alcohol from a variety of sources to increase alcohol content and drinkability. Those questionable practices of a century ago are long behind the American wine industry.

Today, more than 500 domestic wine producers make "fortified" wines using brandy or distilled grape spirits. The irony of this situation is that producers are prohibited from telling consumers the wine is fortified on the label.

Use of the term "fortified wine" was included in the standards of identity for wine in the early version of the Federal Alcohol Administration Act, which established the first wine labeling and advertising regulations following the repeal of Prohibition. The term "fortified wine" was removed by amendment to the Act in 1938.

Today, a grape wine having an alcohol content in excess of 14% but not in excess of 24% by volume and having characteristics generally attributed to an alcohol content derived in part from added grape brandy or alcohol is termed a "dessert wine" under Federal Regulation 27 CFR part 4 section 4.21(a)(3).

"Producers are prohibited from telling consumers the wine is fortified on the label."

Further, section 4.39(a)(7) states that "containers of wine, or any label on such containers, or any individual covering, carton, or other wrapper of such container, or any written, printed, graphic, or other matter accompanying such container to the consumer shall not contain any statement, design, device, or representation which tends to create the impression that a wine contains distilled spirits."

Updating regulations

The fortified wine segment of the U.S. wine industry finds these regulations to be outmoded and contrary to the stated mission of TTB to, in part, "administer the laws and regulations in a manner that protects the consumer..." A number of arguments can be made for updating TTB regulations to permit use of the terms "fortified" and/or "grape (or wine) spirits added."

FIRST, withholding information that could affect purchasing decisions does not appear consistent with the TTB's consumer protection mission. By not permitting producers to fully disclose the contents of a bottle of wine through use of the terms "fortified" or "grape (or wine) spirits added" on labels, consumers may be misled by other label language or phraseology.

Further, these terms can be explained and/or clarified elsewhere on the bottle, such as the back label, to provide a more complete description of the "grape wine" in the bottle. Since there is increasing consumer concern for fully disclosing the contents of packaged food and beverages, including specific ingredients, it seems appropriate that regulations provide a vehicle for specifying wine components on the label.

SECOND, prohibition of the use of "port" on domestic wine labels after March 2006 has resulted in significant hardship for the U.S. fortified wine industry. Producers desiring to add a fortified, port-style wine to their product line are forced to create a non-generic, proprietary name and corresponding label.

While developing a proprietary fortified wine label was sufficiently challenging, producers were also confronted with the prohibition to accurately communicate on the label that the wine was fortified with the addition of grape or wine spirits. As a result, producers of new fortified wine are at a competitive disadvantage by the inability to use the terms "port," "fortified," or grape (wine) spirits added.

THIRD, TTB maintains that "fortified" cannot be used as a wine descriptor since the term "fortified" has a meaning for consumers under the Food and Drug Administration (FDA) regulations dealing with foods with added vitamins, minerals, or protein.

One dictionary meaning of fortify is "to add material to for strengthening or enriching." Dictionary.com provides two relevant but separate definitions of "fortify": 1) "to add one or more ingredients to increase its nutritional value," and 2) "to add alcohol to." Further, Merriam-Webster defines a fortified wine as "a wine to which alcohol usually in the form of grape brandy has been added during or after fermentation."

From this evidence, it is clear that the term "fortified" has significant but different meanings as applied to food and nutrition as opposed to "fortified wine." Therefore, the use of "fortified" by the FDA should have no relevance to "fortified" as related to alcoholic beverages.

FOURTH, concern about the term "fortified" implying significant alcohol content as a result of fortification or the addition of brandy, which could increase the incidence of intoxication, has little bearing on reality. It is not unusual for domestic table wines to have alcohol levels over 14% as a result of natural fermentation and winemaking practices.

Further, Federal Regulation 27 CFR part 4 section 4.21(a)(3) prohibits "dessert wines" from exceeding 24% alcohol. Most fortified wines currently produced in the U.S. have an alcohol content of 18% to 19% by volume — only a few points above a substantial portion of heavy-bodied U.S. table wines.

FINALLY, TTB regulations regarding the addition of grape, wine, or distilled spirits appear to be confusing and inconsistent. Regulation 27 CFR part 4 section 4.21(a)(3) clearly speaks of dessert wine as "a grape wine having ... an alcohol content, derived in part from added grape brandy or alcohol ... and having the taste, aroma, and characteristics generally attributed to angelica, madeira, muscatel, and port..."

However, section 4.39(a)(7) prohibits "any statement, design, device, or representation which tends to create the impression that a wine: (i) Contains distilled spirits..." Section 4.39(7) then goes on with a vague disclaimer saying: "However, if a statement of composition is required to appear as the designation of a product not defined in these regulations, such statement of composition may include a reference to the type of distilled spirits contained therein."

The vagueness and inconsistency is evident when the issue of "distilled spirits" is undefined and the "designation of a product not defined in these regulations" is considered. Since fortified wine is a widely produced and consumed alcoholic beverage product undefined by the regulations; it appears that such wines would be subject to a statement of composition and reference to the type of distilled spirits contained in the wine.

Allowing "full disclosure"

Regulations are necessary tools for the administration of an orderly society founded on law. However, regulators need to be sensitive to the ever-changing dynamics of societal evolution. Such concepts need to be considered by all regulatory bodies, including those charged with overseeing the alcoholic beverage industry.

The TTB needs to recognize that "full disclosure" is a significant hallmark of the 21st century. Producers of fortified wines in the U.S. should be permitted to use "fortified" and "grape (wine) spirits added" on labels to accurately describe their products to an ever-expanding base of 21st century consumers. ■

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ADVANCES IN GRAPEVINE VIRUS RESEARCH

BY Judit Monis,
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Viruses, viroids, and phytoplasmas were the subject of the 16th meeting of the International Council for the Study of Virus and Virus-Like Diseases of the Grapevine (ICVG) held in Dijon, France August 31–September 4, 2009. The ICVG meeting is held every three years to promote collaboration and interaction among grapevine pathologists.

The 50th anniversary ICVG meeting will be held at UC Davis, California, in 2012.

There were 161 scientific presentations grouped into nine main sessions. The reader is encouraged to visit www.icvg.ch/archive.htm for more detail.

Introductory keynote presentations

Giovanni Martelli presented an overview of the progress in grapevine virus research in the past three years. Other keynote speakers included Dr. Paul Gugerli, who presented the historical compilation of Grapevine leafroll associated virus (GLRaV-1-9) antibodies produced in the last 25 years and Dr. Valerian Dolja, who spoke about the evolution and gene function of grapevine Closteroviridae, the family that includes Grapevine leafroll associated viruses (GLRaVs).

Detection — Plant material and virus source

Scientists at the University of California (UC) Davis and Mississippi State University independently announced the discovery of a new Grapevine Syrah virus-1 (GSyV-1) and Grapevine virus Q (GVQ), respectively. Each virus was isolated from different vines with different symptoms; GSyV-1 was characterized from a Syrah vine expressing Syrah decline, while GVQ was found in asymptomatic wild Vitis rotundifolia.

Syrah decline (also known as Syrah disorder in California) was first identified in California vineyards in 2004. The symptoms include swollen graft unions, cracking and pitting of the wood, stem necrosis, leaf reddening and scorching, vine decline, and death.

Although the symptoms described for Syrah decline in France appear to be similar, French and South African scientists visiting affected Californian vineyards reported that the disease symptoms in their countries were different. Because there was a low correlation (19%) between the detection of GSyV-1 and Syrah decline symptoms, the etiology of the disease remains unknown.

The study at the UC Davis lab detected GSyV-1 in leafhoppers collected from vines infected with GSyV-1, supporting the possibility of leafhop-

Two field visits were organized to learn about local disease problems, planting selections, and disease prevention. The delegates visited vineyards in Côtes de Beaune, Hautes Côtes de Nuits, Davayé (Mâconnais), and the Jura region (Château Chalon). Typical Burgundy vineyards (Macon) with the "court noue" patchy yellowing caused by the infection of Arabis mosaic virus and Grapevine fanleaf virus. (Photo by Judit Monis) per transmission. The discovery of this virus in asymptomatic wild grapevine species has relevant implications for the sanitary status of rootstocks used in viticulture, because rootstocks do not express specific virus symptoms.

A study to validate sampling strategies under Australian conditions showed that viruses could be detected from late spring into autumn in grapevines graft-inoculated with GLRaV-2, GLRaV-3, and Grapevine fleck virus (GFkV). The same study showed that green petiole and shoot tissue can be used reliably for detection of the above viruses.

Fanleaf and other nematode-transmitted viruses

Recent molecular data analyses of Xiphinema index, which transmits Grapevine fanleaf virus (GFLV), from different geographical areas suggest a common Middle Eastern origin of this nematode. In contrast, the North American Xiphinema nematodes and their associated viruses — Cherry rasp leaf virus, Peach rosette mosaic virus, Tomato ringspot virus, and Tobacco ringspot virus — appear to spread only across the North American continent. The high virus retention and long (at least seven years) survival of infectious nematodes in the absence of host plants suggest that control measures should focus on development of virus- and nematode-resistant grapevines.

A study in Slovenia confirmed that actively growing young shoot tissue, as opposed to dormant vine tissue, is the best material for GFLV testing. This is because the virus resides in the parenchyma and moves quickly to younger portions of the vine during the growing season.

Vineyard survey

Wild and native Vitis species were shown to be reservoirs of viruses that infect cultivated grapevines, and they may play a significant role in virus epidemiology. Rupestris stem pitting associated virus (RSPaV), GLRaV-2, and Grapevine virus B (GVB) were detected in V. californica in the U.S. In Australia, the glory vine (Vitis coignetiae) was infected with RSPaV (Habili, unpublished). In Iran, Grapevine virus A (GVA) was the most prevalent virus detected in wild and cultivated grapevines, while GFkV, GLRaV-2, and GLRaV-6 were found in wild vines.

In many countries, mixed infections of GLRaV-3 with other GLRaV species were frequently detected. A high incidence of RSPaV was reported in cultivated grapevines and wild Vitis species throughout the world.

One study highlighted the importance of vectors (which aid the transmission of viruses) and the possible influence of variety and rootstock in

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virus incidence and distribution in two areas in northern Spain — Rioja and Galicia.

GFLV was more prevalent in Rioja and distribution indicated the presence of its nematode vector. The incidence of GLRaV-3 in Galicia was high as a result of virus transmission by mealybug vectors, while in Rioja, where the mealybug vectors were not present, no evidence of GLRaV-3 virus transmission was observed for 20 years.

The presence of GLRaV-1 was variable within each region, but has decreased in the region of Ribeira Sacra, even though vectors are present. It was suggested that the introduction of new varieties or rootstocks has influenced this change in the prevalence of virus infection.

Mealybug nymphs of Heliococcus spp. in northern Italy could acquire three viruses — GLRaV-1, GLRaV-3, and GVA — simultaneously, but they could only transmit GLRaV-3 efficiently. The citrus mealybug, Planococcus citri, was reported as an additional vector for GLRaV-1.

Two previously unreported species of soft scale insects (Coccus spp.) were shown to transmit GLRaV-3. Because soft scale insects are poorly adapted to grapevines, scientists expect that they will not play a significant role in virus spread.

Phytoplasmas

The phytoplasma session included 11 oral presentations and 29 posters with most focusing on flavescence dorée and stolbur (bois noir) phytoplasmas. For the first time, phytoplasmas have been reported from South Africa. For further information please refer to www.icvg.ch/archive.htm.

Molecular biology — new technologies

To date, 60 viruses have been detected in grapevines. However with the advent of new molecular techniques, many presently unknown viruses can be discovered. High throughput or deep sequencing technology has been used to identify nucleotide sequences related to unknown viruses in diseased vines. This technology is possible because the grapevine genome sequence is available.

The generated sequences from healthy and infected vines are analyzed in a database for the presence of potential pathogens. Using this technology, researchers at UC Davis attempted to determine the casual agent of Syrah decline, an economically important disease of unknown etiology. The deep sequencing technique is powerful; however, due to high cost, only two vines (one healthy and one diseased) were analyzed in this study.

A microarray detection strategy for multi-parallel analysis of 44 viruses developed in Chile promises to be rapid and reliable, enabling detection of many viruses. Grapevine virus detection at UC Davis has been successful utilizing a low density PCR array (LDPA) based on TaqMan technology, which appears to be highly sensitive and capable of detecting more viruses in the same samples compared to the RT-PCR assay.

Virus control and effects on grape production and wine quality

A three-year field trial in the French Champagne region was carried out to determine the effect on virus resistance of rootstocks expressing the coat protein of GFLV. Although the genetically modified rootstock did not confer resistance to GFLV infection, a delay in symptom expression was observed in transgenic vines compared to controls.

In recent years, the spread of GLRaV-3 in South Africa, California, and New Zealand has increased dramatically, with exponential growth in some areas. This event resembles that of the phylloxera outbreak in Europe in the 1860s.

A study initiated in 2002 was designed to evaluate methods of controlling the spread of GLRaV-3 in South African vineyards. The experiment included virus-free tested vines planted in land with no previous grapevine planting history, surrounded by GLRaV-3 infected vineyards. Several practices — including removal of infected vines, insecticidal treatment, and sanitary control of tools and workers — led to a drastic reduction in disease incidence and spread. It is expected that leafroll incidence

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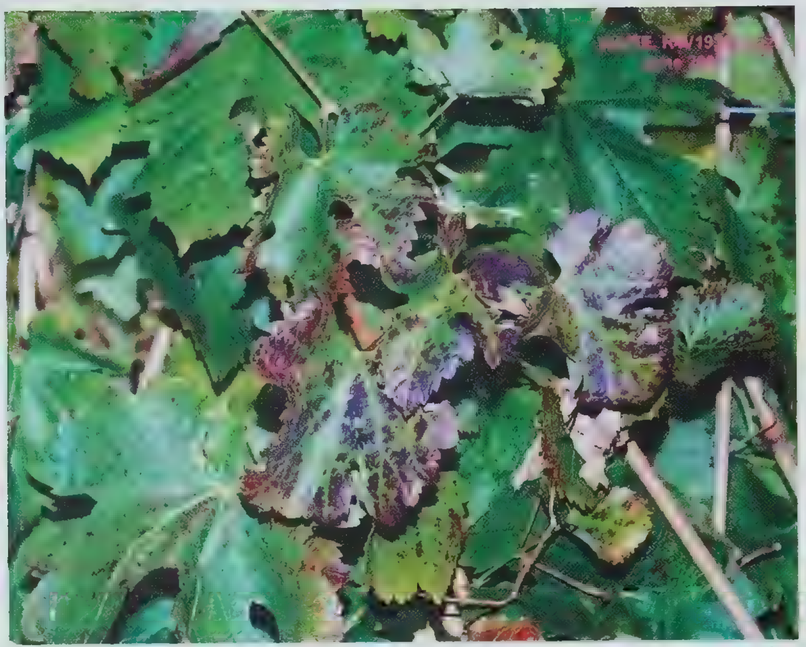

Figure-S: *Milder symptoms caused by Grapevine leafroll associated virus -9 in Shiraz, Waite, Australia. (Photo by Nuredin Habili)*

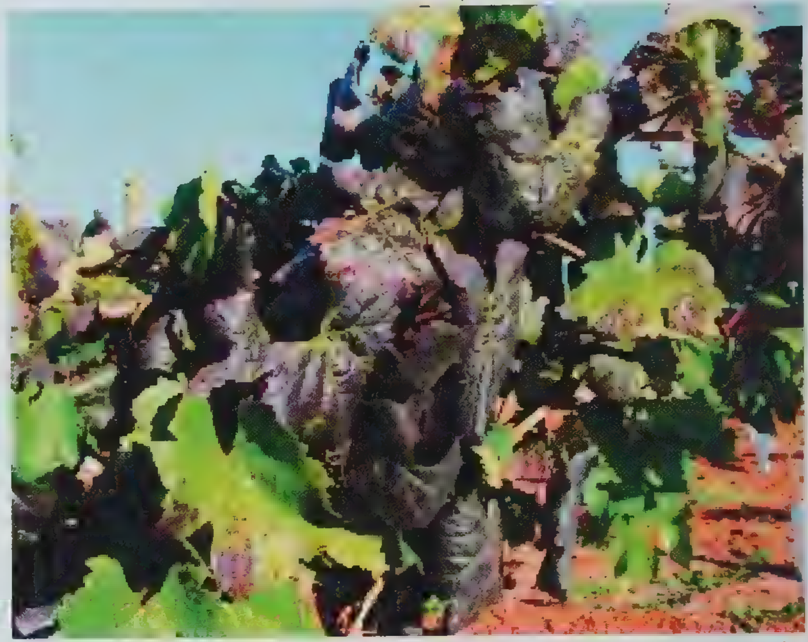

Figure-M: *Severe symptoms caused by Grapevine leafroll associated virus -3 in Malbec CW14 LR3. (Photo by Nuredin Habili)*

will further decrease following the removal of old, infected vines growing upwind from the trial vineyard.

The success of the project was due to coordination among growers, heavy reliance on insecticides, virus testing, and vigilant rouging of infected vines. Although the approach does not appear to be sustainable, South African grow-

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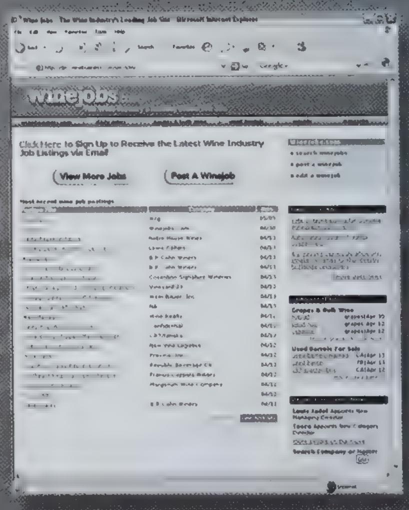

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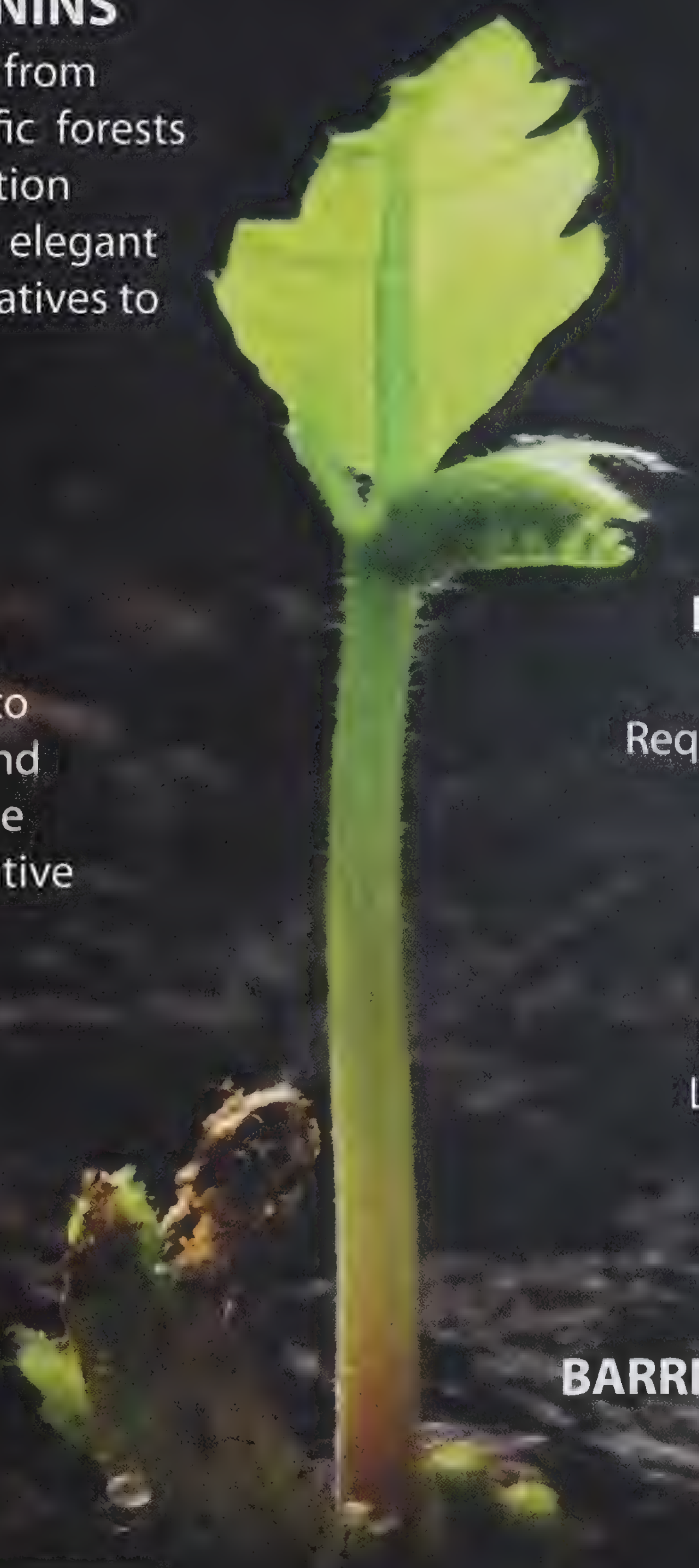

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ers hope to implement an integrated pest management strategy as soon as the disease pressure is manageable.

In South Africa insecticidal treatments for mealybug vectors has been an effective control strategy, but similar practices were not effective in New Zealand, where beneficial insects were destroyed by the insecticides.

A study in northern Spain using micro-vinification of fruit collected from GLRaV-3 and GFLV infected and uninfected vines showed that the presence of viruses had a drastic effect on both fruit set and wine quality. GFLV infection caused reduced alcohol, tartaric acid, and anthocyanins; GLRaV-3 caused reduced alcohol content and color intensity.

Another study indicates vine performance (plant vigor, fruit quality, and yield) was improved after elimination of GLRaV-1 and GLRaV-3. The authors conclude that variation in wine quality depends on the clone, virus, environment, and viticultural practices. More studies are needed to understand the interactions between viruses, vines, and wine quality.

Researchers in California studied the effect on vine growth and fruit quality of GLRaVs, GVB, GFkV, and RSPaV in single and mixed infections. The results showed a drastic reduction of sugar in GLRaV-infected Cabernet Sauvignon regardless of the rootstock used. There was no difference in fruit sugar content between healthy and RSPaV-infected vines.

Foliar symptoms varied notably when one of the multiple infection treatments was grafted onto different rootstocks. The authors hypothesize variable tolerance to different viruses, suggesting that GVB infection has severe effects on certain rootstocks, in particular Freedom.

Viruses of the leafroll complex

The taxonomic classification within the Closteroviridae family is under revision. Presently two genera within the Closteroviridae family — Closterovirus and Ampelovirus — include known leafroll viruses. A proposal to the International Committee on Taxonomy of Viruses will be made to change the status of GLRaV-4, -5, -6, and -9 from virus species to strains of a single virus. The proposal is based on the molecular and serological similarity of these viruses.

One virus, GLRaV-8, reported prior to the grapevine genome characterization, will be removed since its existence was based on serology and partial sequences that share a high degree of homology with the Vitis genome.

Another proposed option is to divide the Ampelovirus genus into two subgroups: A and B. Subgroup A would include species (such as GLRaV-1 and GLRaV-3) with larger particles and a more complex genetic organization, often associated with more severe symptoms (see Figure-M), while members of subgroup B would include viruses with simpler genetic structure such as GLRaV-4, -5, -6, and -9 (see Figure-S). Placement of GLRaV-7 (an assigned Closteroviridae), which is distantly related to leafroll viruses, will depend on the outcome of vector transmission studies.

Strains of the same virus within a subgroup can vary considerably. For example, GLRaV-3 isolates from South Africa differ from isolates from the U.S. and Chile. Further, an Australian mild isolate of GLRaV-3 in Crimson seedless grapes, detected only by ELISA, appears to have desirable phenotypic characters while a severe isolate in the same variety induces severe symptoms and results in undesirable berry characters.

GLRaV-2 is the only known member of the Closterovirus genus that infects grapevines. This virus consists of a number of distinct strains associated with graft incompatibility. In countries where grafting on rootstocks is required to control phylloxera, GLRaV-2 infection has become a challenge.

Sanitary selection programs should aim to test and exclude this virus from certified blocks. In a grafting trial using GLRV-2 and -3 infected Cabernet Sauvignon grafted to several rootstocks, it appears that Paulsen 1103 and Rupestris St. George were most tolerant, while Kober 5BB was the most sensitive rootstock.

Rugose wood complex

Vitiviruses, including GVA, GVB, Grapevine virus D (GVD), and Grapevine virus E (GVE) are associated with rugose wood complex. Studies reported that GVA is transmitted by mealybugs in association with Ampeloviruse GLRaV-1 and/or GLRaV-3. Grapevine virus A was reported to be associated with Shiraz disease (described in Shiraz, Merlot, and Gamay) in South Africa and Australia.

Shiraz disease (not to be confused with Syrah decline) symptoms include delayed bud break, smaller grape bunches with few and poorly colored berries, rubbery canes (poor lignification), and premature death.

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In South Africa, GVA and GLRaV-3 often appear together. Researchers suspect that GLRaV-3 may be needed for the natural spread of GVA in South Africa. However, in Australia GLRaV-3 has not been detected in vines displaying Shiraz disease.

Strains of RSPaV were associated with two major grapevine diseases. An association of 93% was observed between RSPaV-1 and grapevine vein necrosis; while 92% of vines displaying rupestris stem pitting disease were infected with RSPaV-3. Both RSPaV and GVA have been detected in seeds of three grapevine varieties tested.

Emerging diseases and diseases of unknown cause

Studies in Iran confirmed the association of Grapevine yellow speckle viroid 1 and/or 2 with GFLV-induced yellow vein banding symptoms.

Studies in France have been unable to attribute Syrah decline symptoms to any pathogen (known virus or viroid). Syrah decline could potentially be caused by a combination of various pathogens, stress factors, and the genetic makeup of the Syrah variety.

The association of viruses with Shiraz disease in South Africa remains unclear. Studies continue in that region to determine which variants of GVA are associated with Shiraz disease. Phytoplasmas were not detected in Shiraz disease-affected material in South Africa. It is expected that more grapevine viruses will be characterized in the future, and these will most likely be discussed in future ICVG meetings. ■

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SMART VITICULTURE *by Dr. Richard Smart*

Row orientation and sunburn

Vineyards may be thought of as passive solar energy collection systems. Initial planting decisions about row orientation, and subsequent training and trellising, determine the efficiency of sunlight interception. Although some solar collection devices actively track the sun, obviously vineyards cannot. The decisions made at planting and trellising, therefore, are crucial.

At a meeting in Seattle, WA in June with members of the Viticision team from Menlo Park, CA — Dr. Stuart Weiss, Carrie-Anne Kunkel, and Ty Freiberg — we discussed our common interest in sunshine and viticulture, and agreed how knowledge of the sun's position during the day was an important factor in trellis design for vineyards.

Sunlight and vineyards

About 40 years ago, I studied sunlight interception by grapevines, using a computer model. My MSc thesis looked at how different row spacing, vine height, row orientation, and vine shape affected the interception of sunlight in vineyards. One outcome demonstrated that north-south rows were more efficient at sunlight interception than those oriented east-west.

However, growing quality winegrapes is much more complex than intercepting the maximum amount of sunlight. Over the last 30 years or so we have realized that the extent of fruit exposure to sunlight is important for wine quality, and for disease control.

Many studies with many grape varieties have shown that shaded fruit is inferior for winemaking. Shaded fruit is also more susceptible to powdery mildew (Oidium) and Botrytis bunch rot. Such knowledge has led to the adoption of trellis systems that minimize bunch shading, and also leaf removal in the fruit zone.

However, in warm to hot climates, studies have shown that exposed fruit may become **too hot,** and this can have negative impacts on yield and fruit composition for winemaking. Clever research by Sarah Spayd and her colleagues in Washington State has shown that fruit needs optimum exposure to sunlight, while avoiding high temperatures. How can this be achieved in the field?

Why do grape berries get hot?

The answer to this question lies in understanding the factors affecting grape berry temperature. This was another topic of conversation with colleagues from Viticision, as part of their service relies on cluster temperature measurements and prediction of fruit exposure.

Several factors affect berry temperature. First, air temperature varies throughout the day, with a minimum around dawn and a maximum around 3 PM in summer.

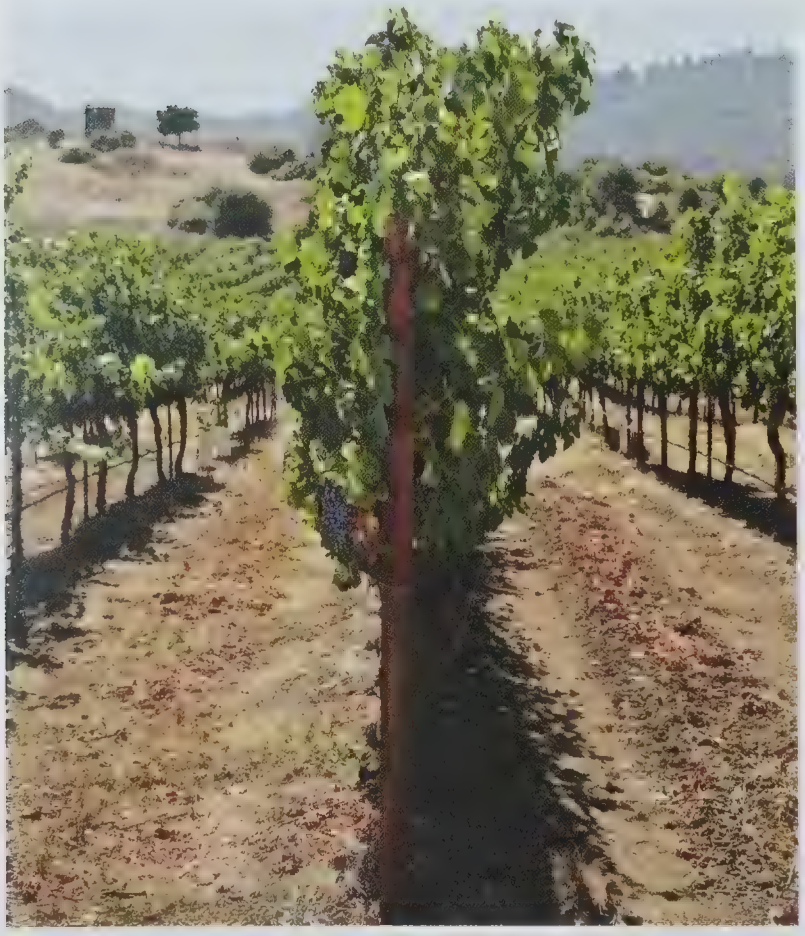

Figure 1: NE-SW VSP vines, shadow under vine.

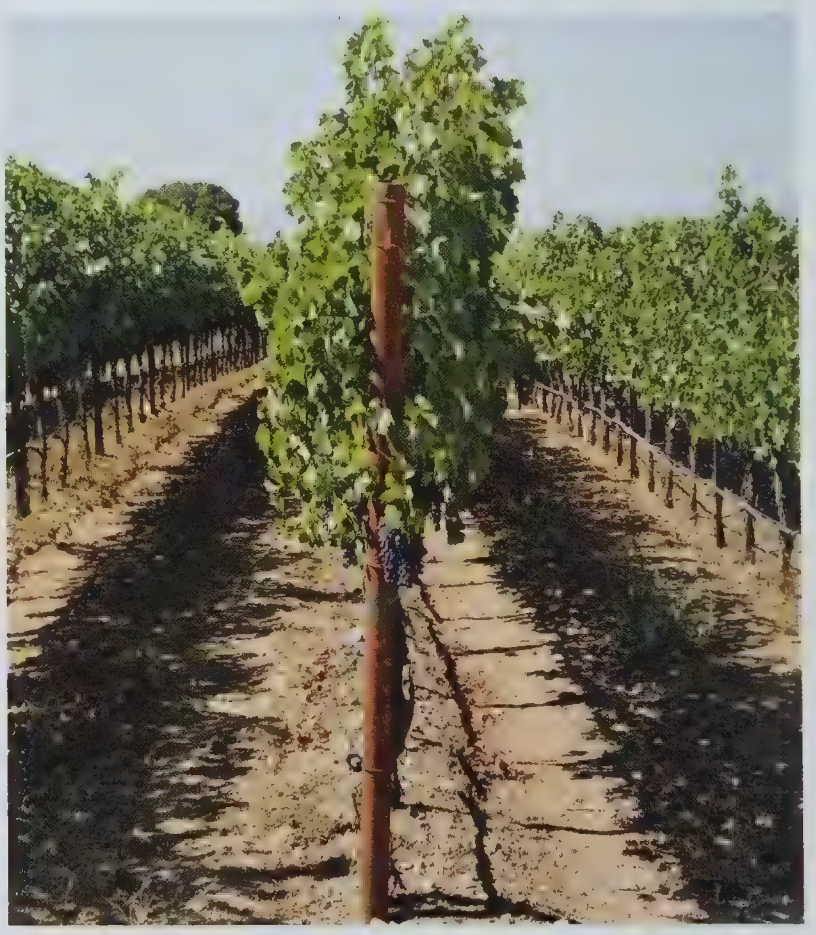

Figure 2: Vine shadow pattern of NW-SE VSP vines in middle of tractor rows. Photos by Carrie-Anne Kunkel.

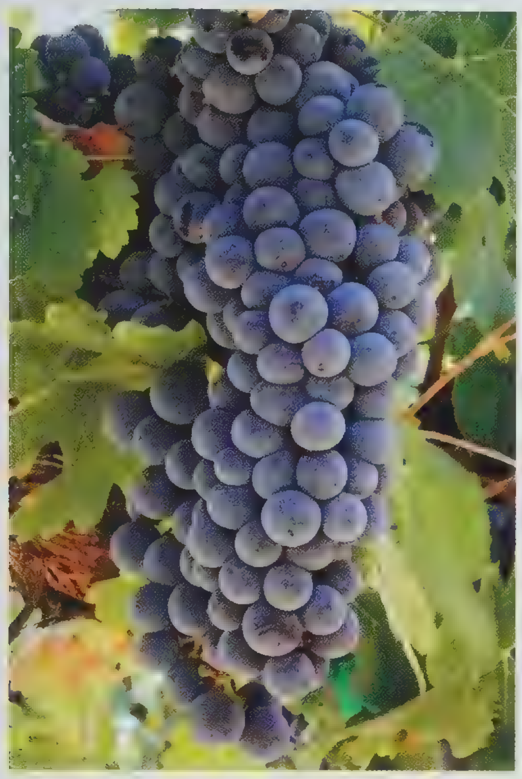

Figure 3A: Cluster in shade, NE-SW vine row.

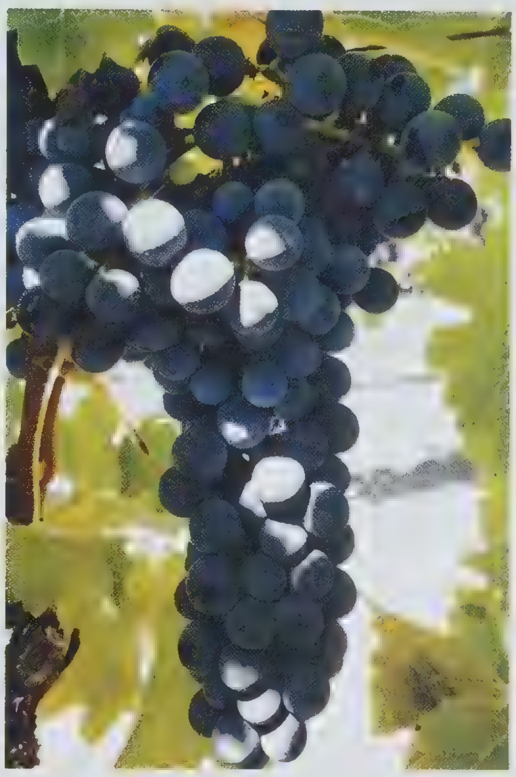

Figure 3B: Cluster with some sun-flecks (dappled light), NE-SW vine row.

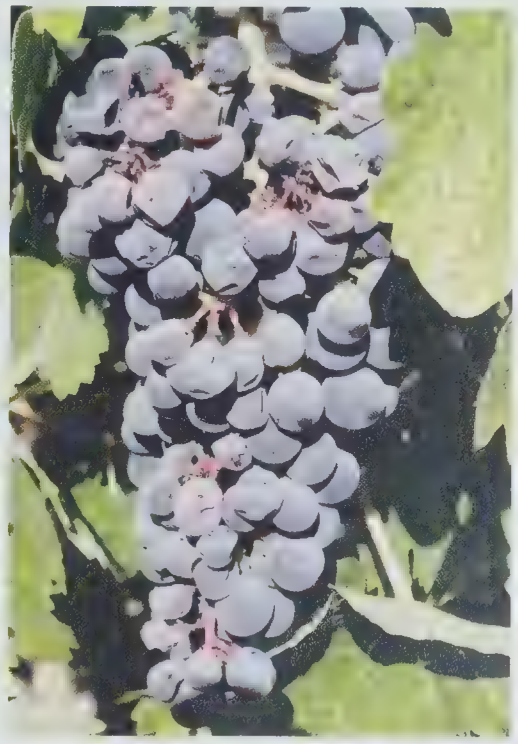

Figure 3C: Cluster fully exposed to the sun in the heat of the afternoon, NW-SE vine row.

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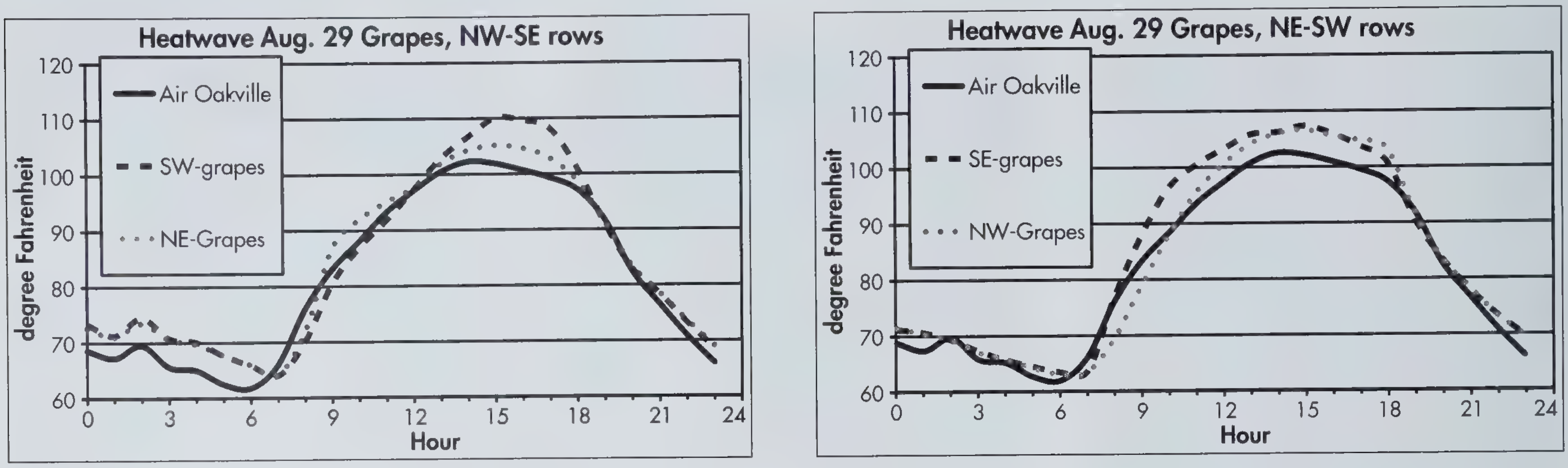

Figure I: Daily cluster temperature curves during a heatwave when temperature reached 102°F.

Grape berries track air temperature, but there can be a delay, and there can be gradients from the exterior to the center of the cluster and individual berries.

Also important are the amount of sunshine and wind. High berry temperatures are recorded for exposed berries on sunny days with low wind velocity.

Other factors of lesser importance are berry size, berry color, and bunch compactness. Big, dark-colored berries, sun-exposed in large, compact clusters, will be heated more then small berries of white grapes in loose clusters.

Avoiding excessive berry temperatures

How can we reduce excessive solar heating of berries in commercial vineyards? First, we need to avoid excessive fruit exposure to the western part of the sky, the location of the sun at the hottest time of day.

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This argues against the common practice of **excessive** leaf removal, where fruit may be exposed from all directions. My rule of thumb is that 50% fruit exposure is sufficient for wine quality optimization, and that 100% is unnecessary, undesirable, and can limit fruit ripening.

From a vine physiology viewpoint it helps avoid sun effects if the fruit has been exposed for a period before any heat wave. It also helps considerably if the vines are well-watered during the heat wave. Trellis design may be modified to produce an overhang of leaves on the western side which can also offer some fruit protection by shading.

Row orientation and fruit exposure

I realize that row orientation is not easily changed unless the vineyard is to be removed. However, sunburn can be reduced when planting new vineyards by modifying row direction from the conventional north-south.

To predict the ideal row orientation for minimizing sun damage, one needs to know the time of day of maximum air temperature during the months when sunburn damage is expected, normally around 3 PM during July and August. Then, simply determine azimuth (bearing) of the sun around that time of day, and use that figure as the approximate row orientation. For California's North Coast, Viticision's Stu Weiss tells me this orientation is around 70°-240°, or ENE to WSW.

This means that the sun will be shining more or less on top of the vine row at the hottest time of the day. The bunches will be more or less shaded by leaves above them. Any exposure to the sun will be mostly on the top berries. In the common situation with north-south rows, when the sun is about right angle to the vine row, the grape clusters have maximum exposure down the side of the clusters.

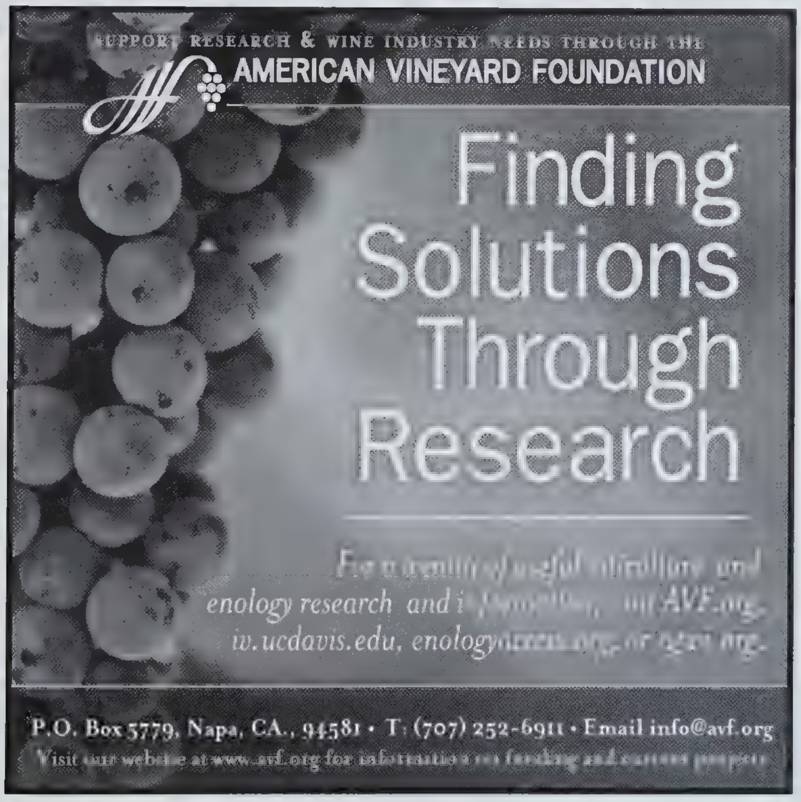
For row orientation around ENE to WSW, the vines' shadow will be almost directly under the row at the time of highest daily air temperature. For north-south rows, the shadow will be across the inter-row area. This difference is shown in the attached photos.

Figure 1 shows the shadow patterns for VSP-trained rows oriented northeast to southwest (NE-SW) and northwest to southeast (NW-SE) in Napa Valley, taken on September 6 at around 3 PM. Note that for NE-SW rows, the shadow is about under the vine because the vine top is in the sun, while for NW-SE rows of Figure 2, the shadows are across the tractor row, and the sun is shining on the canopy side of the vine rather than on the top of the vine. Note that the NE-SW rows are closer to the "ideal" row orientation of ENE-WSW.

Figure 3 has photos of clusters on the western side of NE-SW and NW-SE oriented vine rows, the same vineyard as photos above. Note that the clusters on the NE-SW vine rows are generally in the shade (Figure 3A), or have a few berries illuminated on top of clusters (Figure 3B). Clusters on the NW-SE vine rows are however fully exposed to the sun along the side of the cluster (Figure 3C).

What is the effect of row orientation on cluster temperature?

Viticision team members have made cluster temperature measurements on VSP vines in the Napa Valley, oriented either northeast to southwest or southeast to northwest. These are the same vines in Figures 1 and 2. Cluster temperatures were estimated by placing Thermocron temperature micro-data loggers in ten clusters at the canopy surface, on both sides of the vines,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for both vine row orientations. These data loggers will measure the effect of sun exposure on themselves and adjacent berries.

Data are presented in Figure I for the daily "cluster temperature" curves during a heat wave in 2009, when temperatures reached 102°F. Clusters heated to the highest temperature were on the SW side of the NW-SE vine rows, reaching 110°F (8.2°F above air temperature). Sara Spayd *et al* (2002) suggest that 35°C (95°F) is the temperature above which skin anthocyanin levels are reduced for Merlot, a value applied here. [Spayd, S.E. et al. 2002. "Separation of sunlight and temperature effects on the composition of Vitis Vinifera cv. Merlot berries." *Am.J.Enol.&Vitic.*53:3 171-182]

The cluster temperature curves were integrated above this critical temperature of 95°F, which in the heat wave was reached at around 11 AM. The highest integral was for the SE-facing clusters on NE-SW vine rows (72.6°F hours above 95°F), and the second highest for SW-facing grapes on NW-SE vine rows (70.8°F hours). Values for north-side clusters were lower as expected, being 64.1°F hours NW-facing clusters on NE-SW vine

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rows and 50.8°F hours for NE-facing clusters on NW-SE vine rows.

The clusters with the highest temperature (NW-SE rows) were different from those with the highest temperature time integral (NE-SW rows). So, in this example, recorded during a heat wave, SE-facing clusters on NE-SW vine rows heated during the morning and retained heat after midday, so had the highest critical temperature-time integral.

This example shows that the effect of vine row orientation is not necessarily straightforward, and daily air temperature patterns are critical. The highest cluster temperatures will be for clusters exposed to the west in the mid- afternoon, and these will likely have most sunburn. However, these clusters are not exposed in the morning. Depending on the daily patterns of air temperature, clusters exposed in the morning may have higher temperature time integrals.

Conclusion

The 2010 growing season has been problematic for many growers in California. Generally weather conditions were mild in spring and vine phenology was delayed. Much grape damage was done by a heat wave in late August, when a maximum of 106° was reached in Oakville (Napa Valley). This caused a loss of yield for exposed clusters, and will also impact wine quality.

Hopefully advice from this column might help mitigate such losses in the future, although of course the climate is beyond our control. Growers should avoid excessive fruit exposure to the west, and also encourage moderate fruit exposure as early as possible to encourage acclimation.

Fanning out shoots using a crossarm at the top of the canopy, effectively making it wider, will help provide some shade to bunches lower in the canopy. Such shading will provide some protection from the afternoon sun, and yet not so deep as to impact negatively on fruit composition. This will be particularly effective for rows with a near-ideal orientation of around east-northeast to south-southwest.

However, despite trellis design, one of the most important factors altering berry temperature is air temperature. With projections of future global warming and more heat waves, such problems as occurred in 2010 will likely be more common in the future. ■

For more information, go to www.viticision.com, or email: carrieanne@viticision.com.

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Grain orientation effect on oak flavor extraction

Continued from page 26

re-use of the oak, a five-week exposure to fresh wine would result in only minimal furfural (less than 300 µg/L) and about 400 µg/L of vanillin.

The results also demonstrate that vanillin is extracted much more efficiently from cross-cut exposed wood than radial-exposed wood. This result demonstrates the benefit of cross-cut grain exposure in barrel alternatives. In our study, the cross-cut exposure provides a much more rapid extraction of the measured flavor compounds into the wine compared to parallel exposure.

Conclusion

Cross-cut grain exposure greatly impacts the rate of extraction of the flavor compounds furfural and vanillin from toasted oak. Additionally, the rate of extraction of furfural is much greater than that of vanillin most likely due to the higher solubility and lower molecular weight of furfural. Furfural was also completely extracted from the longitudinal-exposed wood within three weeks, thus re-use of such barrel alternatives would result in different flavor compositions in finished wine. ■

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Created with the joint input of growers, vintners, and allied industry members, the Unified Wine & Grape Symposium provides wine and grape industry professionals with direct access to the latest information they need to remain competitive. Jointly organized by the American Society for Enology & Viticulture (ASEV) and the California Association of Winegrape Growers (CAWG), the Unified Wine & Grape Symposium represents the collective experience, knowledge, and background of the entire industry.

For additional information, please call 530/753-3142 or go to www.unifiedsymposium.org.

February 8-11, 2011

Washington Association of Wine Grape Growers

Three Rivers Convention Center & Toyota Center, Kennewick, WA

The Washington Association of Wine Grape Growers 2011 Annual Meeting, Convention and Trade Show will begin with three new workshops plus a Social/Mixer on Tuesday, February 8. The workshops cover tasting room training, grower payment options from contracts to liens to PACA, and professional development.

The Annual Meeting is the premier educational opportunity for the northwest U.S. grape and wine industry and features sessions and workshops, for growers and wineries. The annual meeting is one of the largest events of its kind and draws key industry players including wine grape growers, wineries, winemakers, marketers, product and service providers, educators, and media from the U.S., Canada, and Europe. The trade show, in a large arena, includes 160 booths.

Visit wawgg.org for more information, or tel: 509/782-8234.

February 17-19, 2011

MGGA Cold Climate Grape and Wine Conference

**Sheraton Bloomington Hotel
Bloomington, MN**

The Minnesota Grape Growers Association presents the Seventh Cold Climate Grape and Wine Conference to include 2½ days of viticulture, enology, and marketing/management sessions for the cold climate grape grower and winemaker. There will be a trade show, wine stroll, silent and live auction, and banquet featuring award-winning wines from the International Cold Climate Wine Competition.

For more information contact: Lisa Smiley, lisa@coldclimategrapes.com, Website: www.mngrapes.org. For exhibitor information, contact: Bob Mignarri, bob@qemonline.com

March 29-30, 2011

Second International Wine Microbiology Symposium

Tenaya Lodge at Yosemite

California State University, Fresno Viticulture & Enology Department will present wine microbiologists from universities, yeast and bacteria producers, wine industry service companies, and wineries from around the world. Speakers will include: Sakkie Pretorius (Australian Wine Research Institute), Hentie Swiegers (Chr. Hansen, Denmark), Linda Bisson (UC Davis), and Christian Butzke (Purdue University). Sponsorship opportunities are available.

For more information, contact: cynthiaw@csufresno.edu.

Statement of the Ownership, Management and Circulation, as required by the Act of Congress of October 23, 1962, Section 4369, title 39, United States Code, of *Practical Winery & Vineyard*, published bi-monthly in San Rafael, CA.

1. The date of this filing is September 30, 2010.
2. The location of the publishing office is 58-D Paul Drive, San Rafael, CA 94903.
3. The name of the publisher is Don Neel, address as above.
4. *Practical Winery & Vineyard* is jointly owned by Donald F. Neel and Wine Communications Group.
5. For the year preceding this filing, the average number of copies printed per issue was 3,443. Paid circulation averaged 2,800. Free distribution averaged 318, and total distribution averaged 3,118.
6. For the single issue printed nearest the filing date, 3,500 copies were printed, paid circulation was 2,766, free distribution was 318, and number of copies distributed was 3,084.

I certify that the above statements are correct and complete.

Don Neel

Publisher, *Practical Winery & Vineyard*

COMPLIANCE COUNSELING *by Rachel Dumas Rey*

A Look Back at 2010

Milestones and Movement in winery compliance

License renewal season is a busy time — coupled with the monthly, quarterly, semi-annual, and annual reporting requirements of our numerous winery clients — but it is a good time to review the accomplishments, developments, and frustrations of another year in winery compliance. 2010 saw increased clarification on direct shipping laws from various states, another attempted power grab by wholesalers to reduce those direct sale privileges, and some important revisions to California ABC and Federal TTB laws and enforcement. I have selected a few highlights to recap the year for the industry.

All tasting rooms in California may now sell wine by-the-glass. On January 1, 2010, AB1470 was signed into law, allowing duplicate-02 (offsite) tasting rooms to sell wine by-the-glass or bottle for onsite consumption, an extension of the privilege granted to onsite tasting rooms in 2009. This option confers a value-added experience on California wineries, allowing patrons to purchase a glass of their favorite wine to sip, onsite, during a live music event, a picnic, or an afternoon visit.

On a related note, California's Alcoholic Beverage Commission (ABC) will no longer require joint or cooperative tasting rooms to delineate space for each licensee at the tasting bar. This change will relieve many joint tasting rooms of the complications of keeping individual wines in separate 5x5 spaces at the bar. It will also make the customers' experience much more pleasurable by allowing them freedom to walk around the room, browse the offerings of various wineries, and enjoy wine from anywhere at the bar.

New York introduces an annual excise tax filing option on direct-to-consumer sales. The Empire State's MT-40 form can now be filed annually upon approval by the N.Y. State Tax Department. For small wineries, this means no more writing a 24-cent check every month and mailing it with a 44-cent stamp! On that topic, many states are improving their electronic filing capabilities for both wholesale and direct shipping reports, a "work smarter" sign of the times.

TTB cracks down on timely filing of ownership changes. The stressed economy has led to mergers, acquisitions, and ownership changes for wineries of all sizes in 2010, as companies seek to reduce overhead or strengthen market share. In the past, the Treasury Department's Alcohol and Tobacco Tax and Trade Bureau (TTB) published, but did not necessarily enforce, a 30-day deadline for reporting such changes. Now, however, if a winery changes its entity name (i.e., sole proprietor to LLC) or adds owners with more than a 10% share, the TTB is requiring the company to apply for a revised Federal Basic Permit within 30 days of that change or risk receiving a certified cease-and-desist notice. This means no wine removals or fermentation, and ignoring the cease-and-desist notice could constitute a criminal offense.

If you are a small producer, take careful note: Once the transfer files enter into the Tax Auditing Division of the TTB, review of excise tax liabilities subsequent to an "untimely filing" could result in a disqualification of the tax credit eligible to small producers. The disqualification would be assessed retroactively for all wine previously removed from bond. If the transfer application is filed years after the actual transfer of control, this could involve a hefty price tag.

New Mexico is the lone reciprocal state. Iowa's move to require out-of-state wineries to secure a direct shipping permit beginning July 1, 2010 left New Mexico as the only relic of the once-powerful cooperative strategy of direct wine shipping. For those keeping track, 37 of the 50 states (74%) now allow offsite direct-to-consumer (DTC) sale of wine.

What's on the horizon for DTC? With the January 2010 Federal Appeals Court affirmation of the Family Winemakers of California lawsuit against discriminatory volume caps in Massachusetts (and the recent decision by the Massachusetts Attorney General not to appeal the case), perhaps there will be movement in that state toward a fair law granting equal access to out-of-state wineries of all sizes.

Queries surround the legality and viability of third-party fulfillment services. With the failure of New Vine Logistics (Napa, CA) and the California ABC letter calling the practice of these businesses questionable under current state law, some states have begun to crack down on this practice of shipping from a third party warehouse.

Some state liquor boards are threatening to outlaw the use of fulfillment warehouses as direct shipping portals, requiring wine to ship only from the premise address. Virginia's ABC recently drafted a positive change to its previous ruling to disallow shipments from anywhere other than the licensee's physical address.

With help from the Wine Institute, a work-around proposal establishes that shipping from these types of warehouses will be allowed, providing the warehouse holds a valid home state license itself, has a fulfillment contract with the winery licensee, and keeps accurate records of all shipments to Virginia consumers. This bill is still in the works and should be finalized by summer 2011. While these "pick and pack" relationships can be very efficient for many wineries, such services do not exempt a winery from obtaining the necessary licenses and paying/reporting taxes due on sales.

HR 5034 support deflates under pressure from supplier trade groups and consumers. On September 29, the so-called C.A.R.E. Act went before Congress, where Wine Institute representatives and other industry representatives skillfully downplayed the wholesale lobbyist claims that direct to consumer wine sales lead to underage drinking and flagrant violations of state liquor law. In April, HR 5034 — supported by powerful beer and wine wholesale lobbying groups—was introduced in the U.S. House of Representatives. Sponsors of HR 5034 claimed to be reaffirming the 21st Amendment, under which individual states, not the federal government, have the primary authority to regulate alcoholic beverage sales. Actually, the bill was an attempt to roll back direct shipping privileges of wineries nationwide.

The Granholm decision of 2005 stated that the Commerce Clause of the U.S. Constitution (which enforces the equal treatment of all businesses regarding trade) takes precedence over the 21st Amendment. HR 5034 attempts to switch that around, so that the 21st Amendment trumps the Commerce Clause.

If the bill becomes law, states could legally discriminate against out-of-state wineries and even ban out-of-state shipping altogether. When challenged, such a ban could be upheld if the state could show, in any small way, that the ban would contribute to the "promotion of temperance, the establishment or maintenance of orderly alcoholic beverage markets, the collection of alcoholic beverage taxes, the structure of the state alcoholic beverage distribution system, or the restriction of access to alcoholic beverages by those under the legal drinking age."

HR 5034 would put the burden of proof on the plaintiffs (wineries and retailers) regarding some incredibly debatable subjective issues. At press time for this article, the hearing on this bill was not likely to be held before Congress goes into recess, but does not seem to be going away for good.

With some major grassroots campaigning from suppliers and consumers, this controversial bill could be sidetracked, but there are many members of Congress who have several powerful distributors in their districts, while representatives from the nation's wine producing regions are less numerous. Numbers = votes, therefore consumers and producers who rely on direct shipping to maintain profit margin should make their voice heard now. At press time, no decision had been made, but an excellent case has been presented to throw out this flawed legislation.

Looking ahead

As another busy year in the wine compliance world comes to a close, Compli wishes wineries and vineyards throughout the U.S. many successes in the upcoming year. While you continue to produce sustainable, consistently high-quality grapes and wine, we promise to do our part by constantly monitoring the compliance environment and delivering superior service to our clients. As we say in our motto, "You did not get into this business to deal with red tape; WE DID!" ■

Rachel Dumas Rey is president of Compli, a full service beverage compliance firm in Paso Robles, CA. Prior to establishing Compli in 1977, she worked for the U.S. Department of Commerce Export Administration in Washington, D.C.

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CARBON NEUTRALITY: THE NEW BLACK

BY Malcolm Sutton

With Australia's leaders arguing about the merits of an Emissions Trading Scheme (ETS) and talks of carbon emissions becoming synonymous with irregular weather, the term "carbon offset" often springs up. Frequently viewed as a silver bullet providing atonement for one's dirty laundry, it is a term becoming increasingly prevalent and attractive for marketers of Australian products.

For those who are not exactly sure what it means, the Australian Macquarie Dictionary (Fifth Edition) explains the term carbon offset as "a measure which compensates for greenhouse gases produced in some other part of the economy, as by [for example] planting trees to a sufficient quantity to compensate for the gases produced by airline travel."

In wine circles, perhaps the loudest voice referring to carbon offsets and the carbon neutrality they claim to offer is that of Taylors Wines of Clare Valley (see October 2009 *Australia & New Zealand Grapegrower & Winemaker*).

How do carbon offsets work?

Late in 2009, Taylors Wines launched its "Eighty Acres" wine range, saying it was the first wine range to possess 100% carbon neutrality in accordance with the International Organization for Standardization lifecycle assessment 14044. This means that Taylors Wines took complicated and exhaustive measures to calculate every puff of greenhouse gas (GHG) its wine products created — from growing grapes in the vineyard and turning it into wine, to a wine drinker jumping in their car to buy a bottle from the nearest outlet before finally recycling the empty vessel.

The amount of carbon created was then "offset" through Carbon Neutral (Australia), one of many emerging carbon offset companies that claim to mitigate clients' carbon pollution through emission reduction projects — predominantly the planting of trees for carbon sequestration (storage) or through projects such as landfill reduction and supporting renewable energy initiatives.

Selling carbon reduction packages in "verified emission reduction units" — a credit paid for by a carbon-emitting organization equivalent to one ton of "captured" GHG — such companies have proved to be immensely successful for businesses eager to be seen cleaning up their mess (or at least paying someone else to do it) before enthusiastically splashing their labels with claims of carbon neutrality and environmental consideration.

But for many, the effectiveness of carbon offsetting at mitigating a carbon dioxide-heavy atmosphere is questionable, and still others believe it is making the situation worse — false propaganda hindering real action

Do carbon offsets work?

Dr. Clive Spash (former scientist with Australia's Commonwealth Scientific and Research Organization [CSIRO]), who says he was censored and later disciplined by the research organization for speaking out against carbon trading (the model behind the Australian Government's proposed ETS), notes the concept is flawed.

In a December 2009 paper, "The Brave New World of Carbon Trading," Spash examines the concept of carbon trading, both on a large scale such as Australia's proposed ETS and for voluntary carbon offset companies covering emissions not covered in the ETS. He notes that the schemes provide an appearance that action is being taken when in reality they provide a way for society to avoid directly addressing the problem of increasing emissions.

"The concept of offsets was created under the Kyoto Protocol," notes Spash, *"to refer to emissions reductions not covered by the cap in an ETS. Offsets are based upon projects which are disassociated from the polluting source and either reduce GHG emissions elsewhere or increase the capacity of a sink (for example, forests and soils) to absorb GHG pollution beyond 'business as usual.'*

"Despite the use of the term 'emission reduction,' nom de plume *[French for pseudonym], these offsets do not require a polluting source to reduce emissions, but instead allow them to increase emissions and then aim to offset them elsewhere. They could just as sensibly be called certified 'emission increase' units. Such a process seriously risks further enhancing the greenhouse effect.*

"Offsets are questionable for their accuracy in measuring the amount of carbon uptake, particularly in so-called storage 'sinks' such as trees and soils. The purely physical carbon accounting aspect of equivalence between source and sink is technically fraught with problems. For example, the amount of added uptake in trees and soils varies greatly depending on local environmental conditions, skills of foresters, management practices, and enforcement of regulations."

While trees are known to store carbon, the exact level of carbon they hold is considered variable and its permanency reliant on a stable lifespan for example. Fires, pest infestation, and other day-today factors could compromise the trees' health and lead to carbon release.

In the 2007 Carbon Trade Watch organization paper *The Carbon Neutral Myth: Offset Indulgences for your Climatic Sins*, the authors make such a point, also arguing that even if a tree's lifespan and protection is assured, the carbon will have to be released eventually when the wood finally decays. "Trees are part of the active carbon cycle," they write, "a continual movement of carbon among plants, organisms, water, and the atmosphere.

"Movement of carbon between the active cycle and the inert pool (fossil fuels) is one-way — once carbon is released from the inert pool by burning fossil fuels, it enters the active cycle and will not return to the inert pool unless it undergoes the same sort of millennia-long geological process that transformed it into a fossil fuel in the first place."

Quality concerns

Spash questions the validity of many carbon-offsetting companies, noting that a lack of regulation and moral practice in some instances is causing more damage than good, with companies failing to live up to the promises expected by companies paying to be their clients.

"Offset providers motivated by profit maximization," says Spash, "have the incentive to under-fund GHG emissions abatement.

"Low-quality offsets will be most price-competitive in a market in which standards are hard to monitor and enforce. Where offset providers are motivated by other goals (for example, biodiversity conservation and poverty alleviation), emissions reduction becomes a means to an end rather than the primary motive and may then be treated as such with resulting lack of knowledge, care, and attention."

Spash also notes that those concerned with promoting their self-image as "green" may also pay little attention to the outcome of their actions, citing popular British band Coldplay, which funded carbon offset trees "that never actually grew."

Impact of new standards

In Australia, the Federal Government will enforce a new National Carbon Offset Standard as of July 1, 2010. With the Government's proposed ETS in limbo due to parliamentary blockage, the voluntary carbon market is growing fast (there are now at least 75 companies offering carbon offset schemes in Australia, with forestry followed by renewable energies as the dominant offset methods), leading the government to be concerned over "what consumers and businesses are really purchasing when they buy carbon offsets."

"Varied levels of understanding about carbon offsets and carbon neutrality and varied assessment methodologies can create confusion as to the legitimacy of claims and products," the Government states on the Department of Climate Change and Energy Efficiency website (www.climatechange.gov.au).

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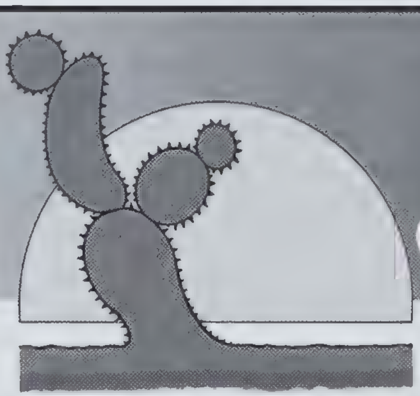

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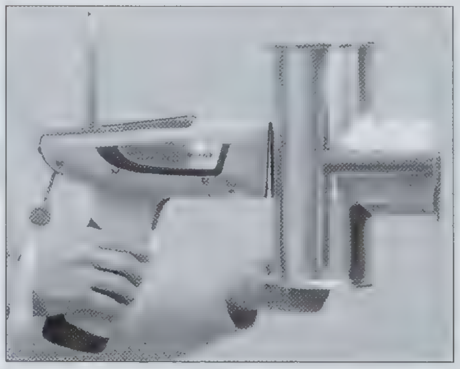

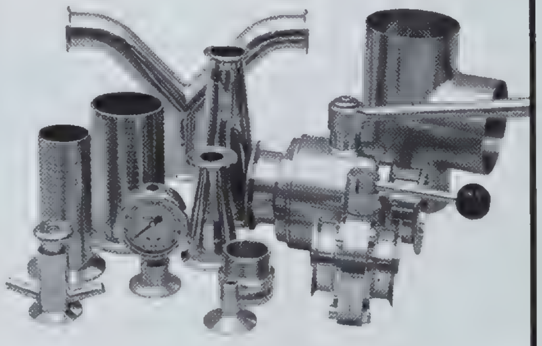

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Suzanne Dickey (of Finalysons, a commercial law firm providing advice on carbon offsetting) notes that the worldwide voluntary carbon market is "huge," with millions of dollars being spent to offset CO_2 emissions. "The Government's new standard will benefit carbon-conscious consumers," says Dickey, "with carbon offset providers having to substantiate their claims through regulations."

But the standard will also provide a guideline for clients who will need to calculate their carbon emissions thoroughly before making any claims of carbon neutrality. "This is one of the major benefits of voluntary carbon offsetting," says Dickey, "even if admitting offsetting alone 'does not reduce a company's carbon emissions.'

"The benefit to the environment from carbon awareness is that in order to calculate how many offsets are required, a company must measure the carbon emissions associated with its operations. This exercise usually reveals a number of ways in which the company can become more energy-efficient and less carbon-intensive."

This was certainly the case with Taylors Wines, which, by its own desire to reduce its environmental impact, recruited former technical, engineering, and processing consultant Provisor (now integrated into the Wine Industry Cluster) to help calculate emissions thoroughly.

This effort reinforced Taylors' commitment to lowering the company's impact on the environment. Other initiatives included constructing a cellar with in-built temperature controls to cover more wine in one area, utilizing large-flow dynamics with larger diameter pipes, using projectile-injection devices instead of water to push fruit through pipes, using inert gas to mix liquids inside 140,000-liter blending tanks instead of pumping, recycling all the winery's water for reuse on the vineyards, supporting local regeneration projects, and packaging the Eighty Acres range in glass bottles that are 40% lighter than regular bottles.

Moving toward carbon neutrality

But while few would dispute Taylors' on-site commitments to reducing its environmental impact, it is the claims of carbon neutrality through offsets that attract cynicism, with University of Adelaide Environment Institute Climate Science director Barry Brook describing offset schemes as "utterly tokenistic."

"Unless we solve the energy supply problem," says Brook, "all the offsetting in the world will not matter a hill of beans. Besides, there's already too much CO_2 in the atmosphere, so we should be aiming at draw-down [through methods such as improved soil carbon management and biochar — using charcoal to draw carbon out of the atmosphere into the soil], not offsetting, if we are serious about the problem."

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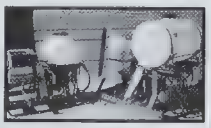
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But Carbon Neutral (Australia) General Manager Angela Tillier is adamant that offsets created from actions such as reducing landfill and methane are effective, along with planting and protecting trees to sequester CO_2 and help protect soil in agricultural areas from salinity and erosion.

"Many scientists support planting trees to sequester CO_2," says Tillier, "and the benefits of tree planting far outweigh any potential problems. It is recognized by scientists that trees are the only cost-effective method we currently have available to remove CO_2 from the atmosphere now.

"While any organization is first and foremost responsible for reducing their emissions, such as reducing energy consumption and using fuel-efficient vehicles, grape growers may be limited in their facility to plant trees for carbon sequestration, making companies such as Carbon Neutral a useful way to offset their emissions.

"All companies will take the most cost-effective method for them when they are aware of it," says Tillier. "Calculating a carbon footprint identifies the emissions-intensive stages so the company can focus on ways to reduce that emissions intensity, and since cost savings flow from reducing those emissions it is a win-win."

Tillier also notes that the marketing prowess of being seen to be reducing GHG emissions is significant, quoting former Coca-Cola chairman Neville Isdell as saying, "Consumers are looking to companies, not government, to solve issues like pollution, climate change, and water and food shortages — supporting sustainability is now crucial for business profitability."

It is a benefit that is not lost on cynics.

"Carbon offsets are the modern-day indulgences, sold to an increasingly carbon-conscious public to absolve their climate sins," the authors of *The Carbon Neutral Myth* note. "[But] promoting more effective and empowering approaches involves moving away from the marketing gimmicks, celebrity endorsements, technological quick-fixes — exploitation that the carbon offsets industry embodies."

In the grape and wine industry, save a few "regional champions," viticultural consultant Kym Ludvigsen considers the area of carbon offsetting as largely unknown. "We need to get a better picture of what exactly carbon offsetting is, what carbon sequestration is, what a carbon footprint is.

"Most would probably think that action in this area is just another cost to business, so we need information on how reducing our carbon footprint can also serve to reduce business costs (or at least be revenue neutral) and improve our operational practices.

"Is it a marketing scheme? These issues can start as market-orientated schemes, but who really cares if the end result is a better place for our children and the longer-term sustainability of our farms and vineyards?"

Dickey concludes, "Measuring and reducing emissions is the entrée and main; offsetting is the dessert." Stand by for a deluge of company logos, labels, and t-shirts claiming carbon neutrality in a market of smoke and mirrors.

Recommendation: grab a modern dictionary and look up the word "greenwash." ■

For more information about carbon neutrality and offsetting, visit www.carbonoffsetguide.com.au/about, www.carbonneutral.com.au, www.climatechange.gov.au/government/initiatives/carbon-offset.aspx, www.carbontradewatch.org/, www.ideas.repec.org/p/pra/mprapa/19114.html and www.bravenewclimatecom/?s=carbon+offsets

This text was edited from original publication in the Australia & New Zealand Grapegrower & Winemaker *written by Malcolm Sutton (staff writer), April 2010, with publisher's permission.*

Chemical/sensory profile of water immersion barrels

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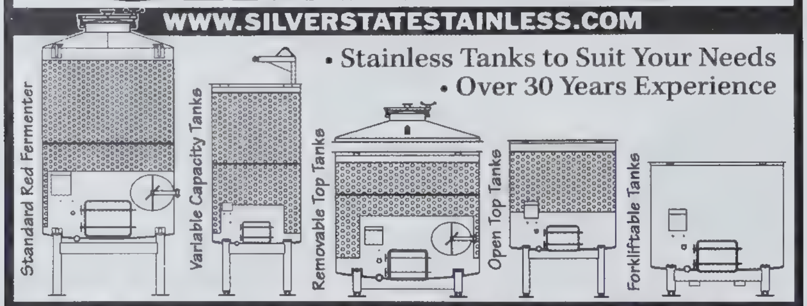

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58-D Paul Dr.
San Rafael, CA 94903

PRACTICAL
WINERY
& VINEYARD

NOVEMBER/DECEMBER 2010

OAK COOPERAGE SHOWCASE

DARGAUD & JAEGLE
HERITAGE BARRELS
SEGUIN MOREAU
Sirugue
T.W. Boswell
MARCEL CADET
Quintessence
NADALIE
MEYRIEUX FILS
MERCUREY
François Frères
Vernou
Tonnellerie Ô
BOUTES
BOUCHARD
ALLARY
CANTON
Giraud
KELVIN
MARSANNAY
GARONNAISE
ROUSSEAU
Saint Martin
DAMY
VALLAURINE
TRUST
KÁDÁR
VICARD
Billon
CADUS
MERCIER
Taransaud
ASSOCIATES
BARREL
Keystone
HEINRICH
Doreau
LEJEUNE
BOSSUET
LEROÏ
World Cooperage
A&K
Saury

Fine Northern Oak
Suber Lefort
OAK ADD INS
StaVin
Laglasse
BEST OAK
XTRAOAK
Creative Oak
ēvOAK
ŒNOTAN SELECTION
VinOak

PLUS OAK INSERTS, CHIPS, AND POWDER

AMERICAN TARTARIC PRODUCTS, INC.

American Tartaric Products is now offering Australia's finest oak barrel alternatives to the U.S. wine industry.

Heinrich oak barrel alternatives have a unique heritage dating back two decades. Working together with Australian winemakers, the Heinrich brothers developed high-quality oak barrel alternatives. Original recipes created through trial and error were perfected through extensive collaboration. Years later, these distinctive recipes are showcased through the Heinrich alternatives product line, which supplies wineries all over the world.

Tank Staves:

- Available in American or French oak;
- Convection-toasted medium, medium plus, or heavy;
- 60 mm x 8 mm x 915 mm.

Oak Chips:

- Available in American or French oak;
- Medium toast or heavy toast;
- Large size (1.25 mm);
- Available in 10 kg mesh bags.

Oak Shavings:

- Special blend "Heinrich House Toast";
- A blend of sizes made for fermentation;
- Generally added at the crusher;
- Double bagged in 10 kg bags to preserve freshness.

Heinrich Cooperage is introducing a new toast designed for maximum impact of full-on flavor. The Maximum Impact line pushes flavor above and beyond the usual selection. It celebrates the richness of oak and truly shows the potential that oak can have with a wine.

For more information, contact:

American Tartaric Products, Inc.
1230 Shiloh Rd., Windsor, CA 95492
tel: 707/836-6840; fax: 707/836-6843
e-mail: toni@americantartaric.com
website: www.americantartaric.com

PLEASE SEE AMERICAN TARTARIC AD, PAGE 7.

ARTISAN BARRELS

ROUSSEAU, ARTISAN BARRELS SELECTION, A&K COOPERAGE, NOMBLOT, LEJEUNE

Since 1998, Artisan Barrels has offered winemakers a single source for high-quality barrels and puncheons, plus wooden, concrete, or stainless steel wine tanks from artisanal craftsmen in Burgundy, Bordeaux, Cognac, Missouri, and Hungary.

Artisan Barrels offers *Nomblot*'s wide array of concrete fermentation, ageing, and storage wine tanks including the Egg tank; *Lejeune*, from St. Emilion, specializes in variable capacity, compartmentalized, and truncated stainless tanks; and *Rousseau* has three generations of experience with open-top fermentors, maturation tanks, and round/oval oak casks.

Rousseau also offers traditional Burgundian single forest and blend barrels and puncheons, plus *Expert Range: Piano, Allegro, Forte* and *Video* barrels.

Artisan Barrels Selection is a proprietary line of French, and Hungarian oak barrels and puncheons built and toasted to Artisan's specifications. The Bordeaux barrels are certified single French forest and blends; Hungarian oak barrels are built by Balazs Nagy, a long-term, top quality supplier. Small wine and vinegar barrels are built by Allary cooperage in Cognac.

A&K Cooperage offers value-priced Missouri oak barrels: the Traditional barrel, and the *Baccus* barrel with a longer and deeper toast, premium finish, and 24/36 month seasoning.

For more information, contact:

Artisan Barrels
Jérôme Aubin, Gerhard Ziemer,
Marie Bourdillas
6050 Colton Blvd, Oakland, CA 94611
tel: 510/339-0170; fax: 510/339-0173
e-mail: jerome@artisanbarrels.com, gerhard@artisanbarrels.com,
marie@artisanbarrels.com
website: www.artisanbarrels.com

PLEASE SEE ARTISAN BARRELS AD, PAGE 28.

BEVERAGE SUPPLY GROUP

From producer Bernard Pradel of Toasted Oak Company, Beverage Supply Group (BSG) offers multiple-link barrel chain inserts and tank staves. Toasted Oak has three toasting methods: Slow baked (with a profile of vanilla), Infra Red (profile coconut) and Fire Toasted (roasted coffee). Chain inserts consist of 14 staves of 28" x 2.5" x 3/8" secured on a food-grade rod. Tank staves come in 25-lb infusion bags. French oak chips and cubes are also available.

Typical barrel stave and barrel chain insert.

BSG also offers Liquid Oak Tannins – only water and tannin from Cognac, France. Specific forests and a patented distillation process produce these elegant and economical alternatives to new cooperage. Harvest tannin is used at fermentation to lend structure, color, and phenolic balance, while reducing many vegetative qualities at crush. For finishing and blending, try these special liquid tannins: Vanilla, Mocha, Cherry/Oak, and Fruit Enhancer. Request a set of samples to have on hand.

For more information, contact:

Beverage Supply Group
403 Gateway Rd West, Napa, CA 94558
tel: 800/585-5562
e-mail: sbrent@rahr.com
Doug Manning: 707/256-9891
e-mail: dmanning@rahr.com
website: www.bsgwine.com

PLEASE SEE BEVERAGE SUPPLY GROUP AD, PAGE 39.

THE BOSWELL COMPANY

BOSSUET, KELVIN, MERCUREY

With 30 plus years of cooperage experience, the *Boswell Company* represents French and American oak barrels from family-owned, artisan coopers. In 2010, Boswell is conducting trials with barrel alternatives, and plans to carry a line of air-dried, fire-toasted barrel alternatives in 2011.

Tonnellerie Bossuet is owned and operated by Jean-Louis Bossuet. Bossuet barrels offer rich, complex flavors in Bordeaux and Rhône style wines. Mr. Bossuet personally selects and sources his French oak directly from the forest. From there, it is split and naturally seasoned 24 to 36 months. In the cooperage, five master coopers each build Bossuet barrels from start to finish.

Kelvin Cooperage is an independent, family-owned cooperage that specializes in handcrafted American oak barrels using wood sourced from Minnesota and Kentucky. All wood is naturally seasoned outdoors for 24 to 48 months. Complex aromatics and flavors are derived from Kelvin's proprietary Hydra™ toast method, which combines fire, steam, and water elements.

In 2009, *Tonnellerie de Mercurey* built a new, state-of-the-art cooperage that exceeds ISO-9001 standards. This family-owned cooperage specializes in barrels for Burgundy and Rhône varietals. All stave wood is split and seasoned at owner Nicolas Tarteret's mill in Champagne. Proprietary toasts combine with high-quality French oak for distinctive, elegant barrels every year.

For more information, contact:

The Boswell Company
1000 Fourth St., Ste 640,
San Rafael, CA 94901
tel: 415/457-3955
e-mail: staff@boswellcompany.com
www.boswellcompany.com

PLEASE SEE BOSWELL COMPANY AD, PAGE 40.

BOUCHARD COOPERAGES

DAMY, BILLON, VICARD, CADUS, LAGLASSE

Bouchard Cooperages is a global barrel brokerage company representing:

Damy (Meursault) and Billon (Beaune), collectively known as Les Tonnelleries de Bourgogne, providing French and Eastern European oak barrels and puncheons to American producers of Chardonnay, Pinot Noir, Rhône varietals, and more for three generations.

Vicard Tonnelleries (Cognac) is a 100% family-owned and operated company, ISO 9002-certified, incorporating the latest technology with age-old tradition to control the heating process and craft barrels, puncheons, and tanks from high-quality French, Eastern European, and American oak.

Tonnellerie Cadus (Ladoix-Serigny) is a partnership formed by Maison Louis Jadot of Burgundy, Vicard Tonnelleries, and Vincent Bouchard to produce ultra-premium barrels. All Cadus staves are air-dried in Burgundy for at least 30 months, and the toasting process is strictly controlled.

Laglasse (Varize) is a small family-owned French oak trading and processing company that produces high-end staves for Tonnelleries Damy and Billon. Using a patented convection oven heating process, Laglasse now offers premium tank and barrel insert systems made from the same "first-run" French oak that they use to make their barrel staves.

The Bouchard Cooperages website, www.bouchardcooperages.com, contains results of an analytical survey of barrels, a current price list, and other interesting information about the cooperage industry and these suppliers.

For more information contact:

Bouchard Cooperages
PO Box 60, Napa, CA 94559
tel: 707/257-3582; fax: 707/294-6233
e-mail: office@bouchardcooperages.com
website: www.bouchardcooperages.com

PLEASE SEE BOUCHARD COOPERAGES AD, PAGE 34.

CANTON COOPERAGE

"American tradition, French know-how" describes the philosophy of barrel making at Canton Cooperage. As part of the Chene & Cie group (along with Taransaud and Kadar), Canton Cooperage combines the best of American and French coopering techniques in the production of premium American oak barrels.

Canton Cooperage (Lebanon, Kentucky) is in the heart of the Appalachian hardwood forest. Proximity to high-quality white oak allows Canton to select the very best wood. The climate of central Kentucky is ideal for open-air seasoning of the oak (origin and aging of all Canton oak is certified by the international certification agency Bureau Veritas).

Barrel toasting, another key to quality coopering, is done according to time-tested French techniques, combined with the most modern temperature-control technology.

Winemakers may choose from two product lines of Canton Cooperage barrels. Canton's GRAND CRU barrel is made from fine grain, 36- or 48-month American oak and is notable for subtle sweetness and spice. The Canton VINTAGE barrel is made from American oak (air-dried for a minimum of 24 months), and features distinctive vanilla, caramel, and almond characters.

All Canton barrels are available in 225L, 228L, 265L, and 500L formats.

For more information, contact:

Canton Cooperage
5803 Skylane Blvd.#C Windsor, CA 95492
tel: 707-836-9742; fax: 707-836-9759
website: www.cantoncooperage.com

FINE NORTHERN OAK

Fine Northern Oak
Savvy Selection

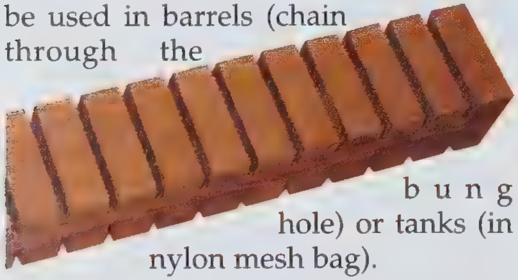
Founding: Fine Northern Oak (FNO), based in Minnesota, was founded in 1999.

Source: FNO uses cooper-quality oak from the northernmost stave mill in the U.S. Cold temperatures cause slow growth, shown by fine grain (growth ring average = 2mm).

Seasoning: Staves are air-dried for two years at the mill.

Toast: Computer-controlled convection ovens yield a deep, consistent toast, giving wine a "fleshy" mouthfeel at all four toast protocols. FNO's House toast, "Extended Medium" is done in an oven for 18 hours at low temperature. One customer describes the aroma as "a unique combination of sweet vanilla and pine cone/ nettles (without the resin-y character normally attached to it); minty and refreshing, cutting through the sweetness of the vanillin."

Cross Cut staves: These are fully extracted in four months due to cross-grain surface area exposure. They can be used in barrels (chain through the bung hole) or tanks (in nylon mesh bag).



Barrel inserts: Installed by coopers after popping the head, inserts allow easy stirring of the lees.

Tank staves: Assembled in a "fan," these are an economical application in the tank.

For more information, contact:
Fine Northern Oak
David Plumb, 952/935-9631
California sales:
Pickering Winery Supply, 707/546-3400
Oregon/Washington sales:
Oak Tradition, 707/318-0002
e-mail: info@finenorthernoak.com
website: www.finenorthernoak.com

PLEASE SEE FINE NORTHERN OAK AD, PAGE 26.

HEINRICH COOPERAGE

Heinrich Cooperage
Barossa H Valley

Founded in 1991 amongst the rolling hills and vineyards of Australia's famous Barossa Valley, Heinrich Cooperage produces premium French, European, and American oak barrels. Heinrich's quality craft offers unique hand-select grain, rugged determination for excellence, and toasts perfected with great care. As a small group of artisans, Heinrich Cooperage works closely with winemakers to capture their bold vision and complement classic varietals.

In the United States, Heinrich barrels are distributed by Tonnellerie Quintessence. The 225L barriques and 300L barrels are ideal for winemakers wanting to make Australian-style Shiraz.

For more information, contact:
Tonnellerie Quintessence
Zach Thompson (Napa, Washington)
Elizabeth Van Emst (Sonoma, Oregon)
PO Box 1851, Sonoma, CA 95476
tel: 707/935-3452; fax: 707/935-3422
e-mail: contact@tonnelleriequintessence.com
website: www.tonnelleriequintessence.com

HERITAGE BARRELS, LLC

VALLAURINE, GIRAUD, HERITAGE, OENOTAN SÉLECTION

Heritage Barrels offers American, French, and Eastern European oak products with a blend of French and American know-how to produce barrels of exceptional quality.

Heritage Barrels is the exclusive distributor for Tonnellerie Vallaurine, the only Rhône cooper in the world. Specializing in standard size barrels up to demi-muid (600L), oak tanks and foudres (oval and round) in French and Hungarian oak. Heritage also offers Giraud, Heritage Barrels American, and "The Continental" fine wine barrels.

Vallaurine offers wood blends of Rive Droite for wines with richness and complexity and Rive Gauche, with softer tannins, ideal for wines of finesse and elegance.

Giraud barrels offer the VS and XOV blend, which have 24 and 36 months of open-air seasoning, respectively. Barrels are also available from specific forests. Black Head™ is a new product from Giraud that adds butterscotch and mid-palette sweetness to wines.

HERITAGE
BARRELS

Heritage Barrels American oak is seasoned for 36 months. *Quercus alba,* tight grain wood free of knots and sapwood, is sourced from Minnesota, Indiana, and Missouri.

"The Continental" is primarily sourced from Hungary (seasoned for 24 months).

Heritage is also the exclusive distributor of Oenotan Sélection, a freeze-dried pure oak extract that can add mid-palate structure to wines.

For more information contact:
Heritage Barrels, LLC
John Schilter,
Managing Partner/Winemaker
tel: 707/598-3285; fax: 707/598-3286
cell: 707/696-7695
e-mail: john@heritagebarrels.com

PLEASE SEE HERITAGE BARRELS AD, PAGE 56.

J. RETTENMAIER USA

For 130 years, J. Rettenmaier & Söhne has manufactured high quality wood and fiber products from native European forests. Best Oak premium oak chips are a continuation of that legacy. Produced from certified sustainable French forests with the highest quality German manufacturing standards, Best Oak premium oak chips have unmistakable aromatic and technical properties, compared with competitive products.

Only the highest quality aged French Oak is toasted by J. Rettenmaier & Söhne's convection method, to produce the most consistent chip size and toast levels on the market for repeatable performance year after year. Best Oak premium oak chips are available in three chip sizes and three toast levels.

J. Rettenmaier & Söhne's newest innovation is Best Oak 2mm oak for crush. Best Oak 2mm oak chips are available in no-toast and medium toast.

J. RETTENMAIER USA LP

JRS

J. Rettenmaier & Söhne's commitment to winemaking led to the proprietary "Aroma Safe" protection concept. In addition to moisture and rot protection, the aroma remains the same as on the day of toasting, even after several months of storage. Best Oak premium products are available in the USA and Canada from J. Rettenmaier USA, LP, www.jrsusa.com.

For more information, contact:
J. Rettenmaier USA LP
16369 US 131 Highway
Schoolcraft, MI 19087
tel: 877/895-4099; fax: 269/679-2364
e-mail: info@jrsusa.com
website: www.jrsusa.com

PLEASE SEE J. RETTENMAIER AD, PAGE 8.

KELVIN COOPERAGE

The Kelvin Reserve barrel is a high-quality, low-cost alternative to expensive French oak barrels. This limited production barrel is made from hand-selected, tight-grain American oak staves (an average of 16 or more growth rings per inch), naturally air-dried for a minimum of 36 months, sourced from either Minnesota or Kentucky forests.

KELVIN 19 63 COOPERAGE

The Kelvin Reserve barrel features the new Hydra Reserve™ toast. The Hydra Reserve™ toast introduces an extended mid-toast steaming process that softens and rounds oak tannins and deepens the toast penetration resulting in a subtle and complex set of flavors.

The marriage between tight-grain, well-aged American oak and a deep, slow-fired toast results in reserved oak tannin extractions and rich complexities that will not overpower the fruit. This combination also yields significant oak flavor impact during the second and third fills, thereby extending the life and use of barrels.

For more information, contact:
Kelvin Cooperage
Paul McLaughlin, Kevin McLaughlin
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West Coast Sales:
Tim Olson, Jim Boswell
The Boswell Company
1000 Fourth St., Ste 640,
San Rafael, CA 94901
tel: 415/457-3955; fax: 415/457-0304
e-mail: staff@boswellcompany.com
website: www.boswellcompany.com

KEYSTONE COOPERAGE

Keystone Cooperage is a third-generation family-owned and operated cooperage located in the heart of Pennsylvania's finest Appalachian forest.

Keystone specializes in making premium wine barrels from American and French oak. The wood is air-seasoned for 24 and 36 months. In American oak, Keystone offers normal and hand-selected tight-grain barrels, which are great for aging Cabernet Sauvignon, Cabernet Franc, Merlot, Syrah, Zinfandel, and Chambourcin. Keystone French oak is sourced from Allier and Never forests, and works well with the wines listed above, plus Chardonnay and other whites.

Keystone Cooperage

In American and French oak, Keystone offers 225L Bordeaux and Burgundy, and a 265L "Gallo" barrel. Keystone also offers a 475L puncheon and 300L Hogsheads in American oak. Toast level choices are light, medium, medium plus, and heavy.

Keystone is unique from other cooperages because they immerse barrels in water before bending, unless a customer requests fire-bending. Water immersion gives each barrel a final rinse, removing any unwanted particles prior to toasting, and helping to improve the American oak stereotype. Keystone notes that the water-immersion barrels are much softer, more elegant, and give a much richer fruit flavor than those that are fire-bent. Research is constantly ongoing as Keystone looks to make its barrels stand out from the competition.

For more information, contact:
Keystone Cooperage
PO Box 269, Jefferson, PA 15344
tel: 724/883-4952; fax: 724/883-4060
e-mail: info@keystonecooperage.com

PLEASE SEE KEYSTONE COOPERAGE AD, PAGE 30.

KNOX INDUSTRIES

TARANSAUD, FRANCOIS FRERES, KADAR, TRUST INTERNATIONAL

Tonnellerie Taransaud (Merpins, France) supplies many kinds of barrels to the greatest wine estates in the world. The Taransaud secret is two-fold: excellent stock of naturally air-dried wood (all age-certified by Bureau Veritas), and great attention to detail. A thermocouple measures the temperature of barrels when toasting. Time and temperature are closely monitored, to prevent surprises.

Taransaud offers 225L, a Taransaud-Beaune 228L barrel, 350L, 500L, and 600L barrels, plus tanks, round casks, and ovals.

For 30 years, Taransaud has installed oak tanks, ovals, and round casks in Oregon and California, including 56 tanks for the To-Kalon Room (Robert Mondavi Winery), 12 tanks for Niebaum-Coppola, and special tanks at Harlan Estate. Tanks at Harlan and Niebaum-Coppola/Rubicon have stainless steel tops with a removable inner cap – ideal for fermentation and/or storage.

In 2007, Taransaud entered into a joint venture with the Kadar cooperage in Hungary. Everything that Taransaud does in France, Kadar does in Hungary.

Tonnellerie Francois Freres is respected for its work with top Domaines in Burgundy, California, and the world. Both Burgundy and Bordeaux-shape barrels are available. In 1999, the Francois Freres group bought 50% interest in Trust International, a producer of excellent, well-priced Hungarian oak barrels. As the species of oak found in Hungary are the same as those in France, barrels resulting from this alliance have been of great interest to winemakers.

For more information, contact:

Mel Knox
Knox Industries
505 29th Ave., San Francisco, CA 94121
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e-mail: mel@knoxbarrels.com
website: www.knoxbarrels.com

LAFFORT USA, INC.

NOBILE

LAFFORT, experts in enology, partnering with Chêne & Cie, experts in wood, offer a range of high quality Nobile® wood products (granular, chips, and staves).

Traceability from the forest, the same quality as oak barrels, and 24+ months of natural seasoning are the important elements of the Nobile® oak selection.

The production process has been developed to ensure reproducibility of Nobile® products: calibration and weighing before toasting, with improved toasting technique to guarantee a toast to the heart of the wood.

Quality control addresses wood components (to control reproducibility of the products), microbiological contaminant control, and heavy metals control.

The Nobile® "enology of wood" line of products has been available in the wine industry for several years, and is approved by winemakers around the world who recognize high quality wood products. Contact Laffort to taste.

For more information, contact:

Laffort USA, Inc.
tel: 707/343-1632
e-mail: charlotte.gourraud@laffort.com; laffortusa@laffort.com; nobile@laffort.com
website: http://www.laffort.com/en/products/nobile;
http://www.laffort.com/en/laffort-usa

PLEASE SEE LAFFORT AD, PAGE 73.

NADALIE USA

TONNELLERIE NADALIE
TONNELLERIE MARSANNAY, OAK ADD INS™

Nadalie USA offers American, French, and Hungarian oak products, with French know-how and heritage in the Napa Valley since 1980.

NADALIE
USA

From the tree to the barrel, Nadalie USA believes in a company tradition of mastering the whole manufacturing process, from tree selection to the final product. The company owns stave mills in the U.S. and France for all American and French oak products. Nadalie seasons woods at its mills for a minimum of two years.

Nadalie USA, in addition to providing fine barrels manufactured from American oak in California, offers world-recognized French oak barrels and tanks from Tonnellerie Nadalie in Bordeaux, France, and barrels from Tonnellerie Marsannay, in Burgundy.

TONNELLERIE
MARSANNAY
BOURGOGNE - FRANCE

From the same trees as its barrels, Nadalie offers Oak Add Ins™ adjunct products. Nadalie is a master in this field with over 20 years' experience in adjunct cooperage products. Nadalie never compromises with quality, fire-toasting all Oak Add Ins™ products, which are chosen with the same rigorous oak tree selection as their barrels.

For more information, contact:

Nadalie, USA/Tonnellerie Française
1401 Tubbs Ln., Calistoga, CA 94515
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e-mail: info@nadalie.com
website: www.nadalie-usa.com

OAK SOLUTIONS GROUP

Oak Solutions Group exclusively distributes ēvOAK and trū/tan.

evOAK

ēvOAK, a line of forward-thinking oak products, represents innovations in design, toasting, and packaging of the finest French and American oak:

ēvOAK Classic tank staves are created with an industry-leading monitoring system, ensuring repeatable, consistent flavors. *High Extract staves* are ideal for blending, and deliver concentrated, singular flavor profiles to suit specific needs. With long-term aging in mind, *Latitude 44° Bordeaux, 45° Rhone, and 46° Burgundy staves* apply a modern approach to traditional aging, to give qualities of finesse and elegance to certain varieties. French for *blend, Cuvée staves* are formulated for winemakers looking for certain flavors.

ēvOAK oak chips and powder benefit from an uncompromising approach to oak selection, seasoning, innovative toasting, and unmatched quality control.

ēnoCUBES are a combination of carefully-selected oak cubes (white and red fermentation blends, aging blends, and finishing blends) for each enological stage.

trū/tan

trū/tan gallo and ellagic-tannins, Oak Solutions Group's newest introductions, are created using oak directly sourced from the same premium forest regions as fine French oak barrels, and blended into three formulas: *f^2 Fermentation Finishing, vf Vinification*, and *rf Reserve Formula.*

Sample kits available.

For more information, contact:

Oak Solutions Group
Paul Abbott, Oak Solutions Specialist
2557 Napa Valley Corp. Dr., Ste. D,
Napa, CA, 94558
tel: 707/259-4988; fax: 707/255-5952
e-mail: pabbott@oaksolutionsgroup.com
Kyle Sullivan, Oak Solutions Specialist
tel: 707/287-8555; fax: 707/255-5952
e-mail: ksullivan@oaksolutionsgroup.com
website: www.oaksolutionsgroup.com

PICKERING WINERY SUPPLY

DOREAU, VERNOU, MEYRIEUX, KEYSTONE

Pickering Winery Supply offers barrels from coopers in Bordeaux, Burgundy, and Pennsylvania.

Tonnellerie Doreau's initial success was with long-aging Bordeaux red wines, but the barrels' elegance and slow extractability have proven ideal for Chardonnay, Italian reds, or any wines that require a finely textured oak backbone for high-quality fruit. An unusual, untoasted barrel is the Selection Thierry "Chauffe Blonde," a component barrel made with the finest-grain, 3-year air-dried oak.

Tonnellerie
Doreau

Tonnellerie Vernou's highly consistent barrels come in different profiles including: "R Toast" for red varietals; "Burgundy Blend" with longer toast, and "waterbent" for Sauvignon Blanc. Vernou offers sizes from 110L barrels, to ovals and upright tanks up to 50,000 liters, and Roll Fermentors in 600L, 900L, or 1,200L. See Roll Fermentors at Tonnellerie-Vernou.com.

Highly-regarded Burgundian cooper Tonnellerie Meyrieux toasts barrels over small braziers for 1.5 hours to achieve a distinctive, smoky, fruit-driven barrel for Burgundian varieties and Syrah. They offer 2-year and 3-year air-dried wood, and puncheons. Production is limited.

Keystone Cooperage has been making oak products for three generations, finding the best and oldest oaks to be transformed into gentle, 60-gallon American oak barrels, exclusively made for wine.

For more information, contact:

Pickering Winery Supply
888 Post St., San Francisco, CA 94109
tel: 415/474-1588; fax: 415/474-1617
e-mail: pickering@sbcglobal.net
website: www.winerystuff.com

PREMIER WINE CASK

DARGAUD & JAEGLÉ, MARCEL CADET, BARREL ASSOCIATES

Premier Wine Cask is the exclusive North American representative for Tonnellerie Dargaud & Jaeglé (D&J) and Marcel Cadet. For three generations, D&J has crafted fine barrels for the top wineries in the world. Exhaustive wood selection and an unwavering commitment to traditional craftsmanship make the D&J barrel predictably elegant. Dargaud & Jaeglé's unique water-bending process conducts heat from an oak fire deeply into the wood to create a subtle and sophisticated spiciness, unmatched by any other barrel.

DARGAUD & JAEGLE
Tonnellerie

Premier Wine Cask is also the exclusive worldwide representative for Barrel Associates International American Oak Collection. With one or more of Barrel Associates' traditional innovative bending and toasting regimes (DeepToast™, Water Bent, Fire Bent), a wine gains luscious depth, complexity, and palate length.

BARREL
ASSOCIATES

Premier Wine Cask is sole representative for Innovative Rack System LLC, and BiBung. Innovative Rack System is a unique steel core polypropylene deep cradle rack designed for safe and secure barrel stacking and moving. The BiBung is a one-of-a-kind barrel bung that provides a better barrier against oxidation and airborne haloanisole contaminants.

For more information, contact:

Premier Wine Cask, Inc.
tel: 800/227-5625
e-mail: info@premierwinecask.com
website: www.premierwinecask.com

SAURY USA

Tonnellerie Saury and Groupe Charlois joined forces in 2009, creating the world's first French cooperage group integrating and controlling the entire production chain from forest to barrel. Further to the goal of becoming a leader in the industry, Tonnellerie Saury and Groupe Charlois recently purchased a lab in Burgundy with four SPME machines, and are developing an R&D project with Dr. Pascal Chatonnet, founder of EXCELL Labs in France. Saury is the only cooperage to be fully compliant with PEFC, ISO 9001, ISO14000 certifications, and HACCP standards.

Saury barrels are renowned for highlighting fruit and extending the palate. The barrels are subtle in extraction and never overpower the wine, but instead highlight the front and mid-palate, and build structure in all varieties.

Saury offers a full range of barrels, tanks, and vats in French, American, and Eastern European oak. Wineries can select traditional fire bending or water immersion, 2- or 3-year air-dried wood, and a full range of grain selections.

For more information, contact:
Saury U.S.A.
433 Soscol Ave, Ste 151B, Napa CA 94558
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PLEASE SEE TONNELLERIE SAURY AD, PAGE 38.

SEGUIN MOREAU NAPA COOPERAGE

Seguin Moreau continues to build on nearly two centuries of tradition and more than three decades of pioneering enological research and development, consistently delivering top quality oak for winery barrel programs.

French, American, Eastern European, and Russian staves undergo the unique Seguin Moreau proactive maturation process in the cooperage's seasoning yards in France and Missouri.

The French oak is PEFC certified for the fifth year and exclusively Haute Futaie, sourced from mature and environmentally sustainable forests managed by the French National Forestry Office.

Seguin Moreau's production team of coopers, classically trained in France and Scotland, crafts barrels ranging from Bordeaux- and Burgundy-style to 500L. The wood is coopered in France, or to winemakers' specifications at the Napa facility, in a variety of toasts during the bousinage (enological toasting).

The Aquaflex process (water immersion to soften the tannin impact of the oak) is available for Burgundy barrels. During bousinage, the staves' high humidity results in a temporarily lower toasting temperature, and a slower but much deeper penetration of the toast into the wood. This makes for delicate aromas of vanilla and soft spices in Pinot Noir and Chardonnay, with more expression of the wine's initial fruit character.

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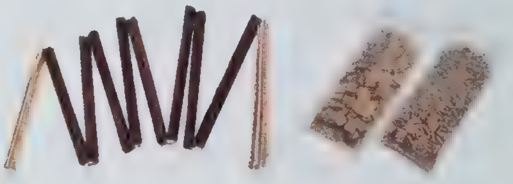
PLEASE SEE SEGUIN MOREAU AD, PAGE 9.

STAVIN

All StaVin oak is naturally seasoned for a minimum of three years, and fire-toasted by traditional methods to deliver the nostalgic aromas and complex flavors commonly associated with barrels. StaVin supplies French, American, and Hungarian oak in medium, medium plus, and heavy toast levels.

StaVin introduces the new "Barrel Head" oak product. This slightly heated oak product, when blended with StaVin toasted products, will add richer mouthfeel and subtle nuances as tasted in only high-end barrels. The Barrel Head is the missing link for barrel alternatives, and the oak is also seasoned for at least three years in order to offer this type of product.



Savour oak uses long-cycle convection toasting seasoning protocol to deliver sweet aromatics and a viscous mouthfeel to wine. StaVin's Tank Stave Fan Packs deliver the same traditional flavors as barrels at a fraction of the cost. StaVin Oak Beans and Stave Segments are packaged in food-grade nylon bags for versatile, cost-effective, toasted oak infusion systems for tanks. The Barrel Replica, Traditional Barrel Insert, and Infusion Tube will revitalize neutral barrels, imparting the complexity and quality of a new barrel.

StaVin's website (www.stavin.com/research.htm) is a definitive resource outlining innovations in oak and oxygenation for winemaking.

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PLEASE SEE STAVIN AD, PAGE 41.

TONNELLERIE BOUTES

Family owned and operated since 1880, Tonnellerie Boutes is one of the oldest, most renowned French cooperages. Headquartered in Bordeaux, Boutes produces nearly 30,000 barrels, along with a variety of upright and oval tanks. Using wood sourced from the noble forests in France, America, and Eastern Europe, Boutes produces Bordeaux and Burgundy-style barrels, and other cooperage up to 600L.

BOUTES
TONNELLERIE DE FRANCE
L' Art et la Matière
Depuis 1880

In order to maintain a consistency of product made from natural resources, Boutes buys directly from the French National Forestry Office, and contracts its own lumberjacks to cut the trees purchased in a biodynamic manner. Trees are harvested only during the descending moon – a traditional, ecological, and conservative way of producing stave wood. These staves are stacked and seasoned for 24 to 36 months in the Allier. Boutes believes this method makes a great barrel with a better conscience.

Boutes is proud to be PEFC-Certified, and is the only cooperage in the world to be certified ISO 14001:2004.

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website: www.boutes.com

PLEASE SEE TONNELLERIE BOUTES AD, PAGE 43.

TONNELLERIE GARONNAISE

Located 90 kilometers southeast of Bordeaux in the small commune of Marmande, Tonnellerie Garonnaise employs the highest standards in barrel coopering. Founded in 1990, Garonnaise made its name working with producers in Cognac, being recognized for consistency of flavors and quality of construction.

In 2008, Tonnellerie Boutes purchased Garonnaise with the goal of maintaining its heritage of old-world craftsmanship and stewardship while integrating new-world methods of manufacturing and distribution.

With the selection of the stave wood through to the highly specific toasting operation, Tonnellerie Garonnaise offers a stylish, unique "Expression" barrel. The Expression barrel is a blend of seasoned Allier oak stave wood which undergoes a very long and gradual deep toast, resulting in slow thermo-degradation of the wood fibers, which imparts seductive aromatics and a rounded, silky texture.

TONNELLERIE
GARONNAISE
MARMANDE
FRANCE

Boutes believes Garonnaise is a complex and rare final product.

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website: www.garonnaise.com

PLEASE SEE TONNELLERIE GARONNAISE AD, PAGE 74.

TONNELLERIE LEROI

Tonnellerie Leroi barrels include: 225L Bordeaux Export, thin stave (22mm) Château Ferre, and 228L Burgundy Export/Traditional, hogsheads, puncheons, and wood tanks.

Tonnellerie Leroi was founded in 1715 in Cognac, France – the oldest continuously operating cooperage in France (formerly Martell). Producer of premium, handcrafted Bordeaux and Burgundy-style artisan wine barrels, Tonnellerie Leroi provides exceptional barrels to North America and the world; almost 300 years after the first Leroi coopers were hired.

Using the very best fine grain oak from the forests of central France, Tonnellerie Leroi continues to make a full range of wine and spirits barrels from sustainable and traceable sourced oaks perfectly suited for fine wines.

The unique climate in the heart of Cognac assists in seasoning Leroi's carefully selected staves, creating integrated, finely textured flavors suitable for making balanced, consistent wines.

Twelve experienced artisan coopers handcraft each barrel with care to strict quality standards.

LEROI
TONNELLERIE

Each Leroi barrel has a unique barcode to provide the wood stave history, while also having a 99.99% TCA-free guarantee.

Tonnellerie Leroi has received ISO 9001 and HACCP certification, and continues its pursuit for excellence in barrel production and customer service. Visa, MasterCard, and American Express payments accepted.

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website: www.leroibarrels.com
facebook: wine.barrels

PLEASE SEE TONNELLERIE LEROI AD, PAGE 52.

TONNELLERIE MERCIER

From forest to cellar, quality control is a priority. Mercier owns their own mill, which, combined with new buildings and modern machinery, ensures consistent and repeatable quality. Each barrel is coded to certify wood, air-drying time, and all manufacturing details. When wineries ask for the same barrel as in the previous year, Mercier can deliver.

Master Cooper Frederic Mercier uses oak obtained exclusively from French forests that have proven to be consistent, continuous sources of premium oak. Available barrels include: 225L Bordeaux with 27mm or 22mm staves, Chateau Ferre, or the Tradition with chestnut hoops, and 228L Burgundy barrels in Export style, or Tradition.

The "Delicate" toast is available for Chardonnay and Pinot Noir. Mercier also offers 500L puncheons.

MERCIER

Mercier's team of experienced winemakers provides knowledgeable help to fine-tune barrel choices. Mercier experts can help winemakers create their favorite barrels, glass in hand, in the cellar.

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PLEASE SEE TONNELLERIE MERCIER AD, PAGE 18.

TONNELLERIE Ô

Tonnellerie Ô handcrafts exquisite French oak barrels that are essential for the world's best wines. Superior quality stave wood is selectively sourced from the finest French oak forests, seasoned in the open air and rain of France, and coopered in California.

For 2011, master cooper Jason Butler is building six traditional styles of Tonnellerie Ô® barrels. All are seasoned 30+ months and available in a range of house toast profiles, with or without toasted heads:

- Bordeaux Château Tradition
- Bordeaux Château Ferré
- Bordeaux Export Thin Stave
- Bordeaux Export
- Burgundy Traditional
- Burgundy Export

Tonnellerie Ô

To learn more about Tonnellerie Ô, or to inquire about scheduling a private tour of the cooperage, please call 707/752-6350 and ask for Ian Hartnett or Andrea Tary. Or visit the website: www.tonnellerieo.com.

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website: www.tonnellerieo.com

TONNELLERIE QUINTESSENCE

Tonnellerie Quintessence intertwines cherished, centuries-old French tradition with modern technology, and defines the cooperage art. Located near St. Emilion just outside of Bordeaux, Tonnellerie Quintessence crafts barrels from the finest oak (*chêne français*), milled at France's most sophisticated PEFC-certified stave operation.

Expert wood buyers take great care in wood selection, searching forests for straight, tight-grain oak. Master French coopers then craft a rare barrel that blends contemporary expertise with the style expected of a French cooperage. Working closely with each winemaker, Tonnellerie Quintessence creates barrels that complement and enhance the unique characteristics of the vintage.

Fleur de Quintessence

Tonnellerie Quintessence recently unveiled a new barrel, *Fleur de Quintessence*. This limited production barrel embodies artistry, French heritage, skilled craftsmanship, and an outstanding wood source. To ensure full transparency, each barrel arrives with its unique toasting graph, and a certificate of authenticity detailing a complete chronology of the barrel's journey from the Tronçais and Jupilles forests to the wine cellar.

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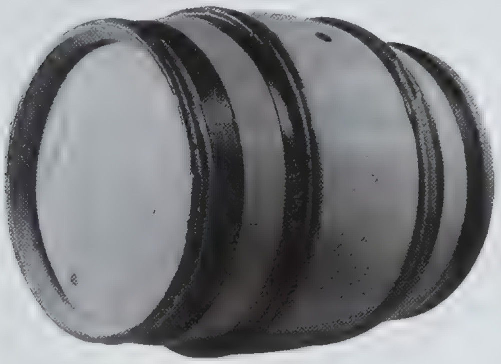
website: www.tonnelleriequintessence.com

PLEASE SEE TONNELLERIE QUINTESSENCE AD, PAGE 2.

TONNELLERIE SIRUGUE

Tonnellerie Sirugue is a family cooperage established in 1903 in Nuits Saint Georges, Burgundy. Sirugue barrels were among the first French oak barrels to be imported to the U.S. for fine wine ageing in the 1950s and 1960s.



Today, Sirugue focuses on wood selection, which is the basis of the cooperage's tasty barrels. Sirugue's wood is selected exclusively from French oak forests in the Allier, Nevers, Chatillon, Center of France, and Vosges regions. The staves are naturally air-dried in Burgundy for a 24-month minimum. A 36-month, air-dried program is also available.

Sirugue produces Burgundy Traditional, Burgundy Export (228L), Bordeaux Export barrels (225L), Hogsheads (300L), and Feuillettes (114L).

Aside from its traditional house-toast, Sirugue has worked intensively to achieve different toasting levels tailored to each customer's individual needs and style demands.

Sirugue's goal is a seamless integration of fruit and oak. The barrels can be sweet, spicy, subtle, and elegant; they enhance a wine's fruit characters and flavors; they lift the fruit, frame it, and make a star out of it.

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PLEASE SEE TONNELLERIE SIRUGUE AD, PAGE 57.

T.W. BOSWELL

Experienced master coopers have developed the T.W. Boswell collection of premium oak barrels, crafted from hand-selected wood. Each barrel has a distinct personality created for reserve-style wines.

The Appellation Series is crafted with premium French oak produced at the cooperage's PEFC and Bureau Veritas-certified stave mill. This series includes: the *Côte d'Or* barrel, providing traditional Burgundian toastiness while encouraging fruit expression; the *Côtes du Rhône*, best-suited for Rhône varietals or blends; and the *Médoc* barrel for more concentrated wines that benefit from extended aging.

T.W. Boswell also crafts the *Legacy* barrel, which adds texture and maintains a proper balance of fruit and oak. The water-immersed *Eau* barrel adds a supple and elegant texture to the palate. Legacy and Eau barrels are available in French and American oak.

T.W. Boswell

The unique characteristics of European oak are celebrated by the *T.W. Boswell Polonyi* barrel. Each year, the Polonyi family harvests fine-grain oak from Slovakian forests and carefully mills it to the highest standards. The Boswell family then applies four generations of coopering expertise to this high-quality wood source.

T.W. Boswell is presented by Cooperages 1912.

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PLEASE SEE TW BOSWELL AD, PAGE 23.

VINOAK USA

VinOak USA offers a wide range of premium oak barrels and Creative Oak™ alternatives to suit any style wine. All oak products are expertly supported by a specialized oak sales and service team, and a technical in-house oak R&D laboratory, led by flavor chemistry specialist, Dr. Kyle Reed.

Creative Oak

Creative Oak alternatives or "instruments," are crafted from premium French oak barrel stave wood, selectively sourced by forest origin and grain from top French stave mills. Seasoned in France, then cut and toasted in California, Creative Oak instruments are available in both fire and convection house toasts in a variety of styles:

- Tank staves (fan, single)
- Tank bags (bricks, half-staves, and squares)
- Barrel inserts (head, bung)

VinOak's outstanding barrel collection includes Barrel 21 – California-coopered American oak barrels fire-toasted in a range of toast profiles. VinOak® also offers Tonelería Quercus™ French and American oak barrels, created in Spain's Rioja region using TRH® – a patented radiant toasting technique to control profile consistency and customization.

To learn more about VinOak USA's fine collection of oak barrels and Creative Oak instruments, contact a sales consultant or visit the website.

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website: www.vinoak.com

XTRAOAK

"So close to a barrel," is what XTRAOAK hears from customers. Benefiting from the expertise of sister cooperages Taransaud and Canton, XTRAOAK offers finest quality French and American oak barrel alternatives, with artful selection of wood, natural air seasoning, consistent convection toasting, HACCP and traceability.

XTRAOAK offers three products for oak renewal in barrels: a barrel insert unit, Oak on a Rope, and Xoakers; and four products for oak treatment in tanks: fan assemblies, stavettes, oak chips, and granular oak.

"XTRAOAK Light" American toast is characterized by the fresh sweetness of new-cut oak, butter, coconut, cream, and light vanilla.

"XTRAOAK Medium" American is a complex array of vanilla, rich cream, marshmallow, roasted nut, and spice.

"XTRAOAK Medium+" American is a dark-roasted American oak which maintains a wonderful sweetness, while also contributing caramelized and roasted characters.

"XTRAOAK Light" French is delicate and bright, featuring light vanilla, cedar, tea, and mineral notes.

"XTRAOAK Medium" French contributes the sweetness of fresh vanilla and cola, overlaying an exotic blend of brown spice, cedar, and tobacco.

"XTRAOAK Medium+" French features notes of burnt cream, mocha, graham cracker, spice, and black tea.

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WORLD COOPERAGE

World Cooperage is an industry-leading cooperage providing consistent quality and value through innovation. Proudly crafting oak barrels using its Barrel Profiling technology, World Cooperage offers diverse, definable flavor profiles that are repeatable barrel-to-barrel and vintage-to-vintage.

To help winemakers identify barrel profiles well-suited to their wine program, World Cooperage has an interactive barrel profiler at worldcooperage.com. This online system allows winemakers to explore time-tested profiles according to their wine and desired wood source.

The World Cooperage team is committed to collaborating with winemakers through scientific research and sensory descriptive analysis to ensure the best pairing between wine and barrel.

Founded in 1912, World Cooperage is a fourth-generation, family-owned cooperage. Presented by Cooperages 1912.

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PLEASE SEE WORLD COOPERAGE AD, PAGE 5.

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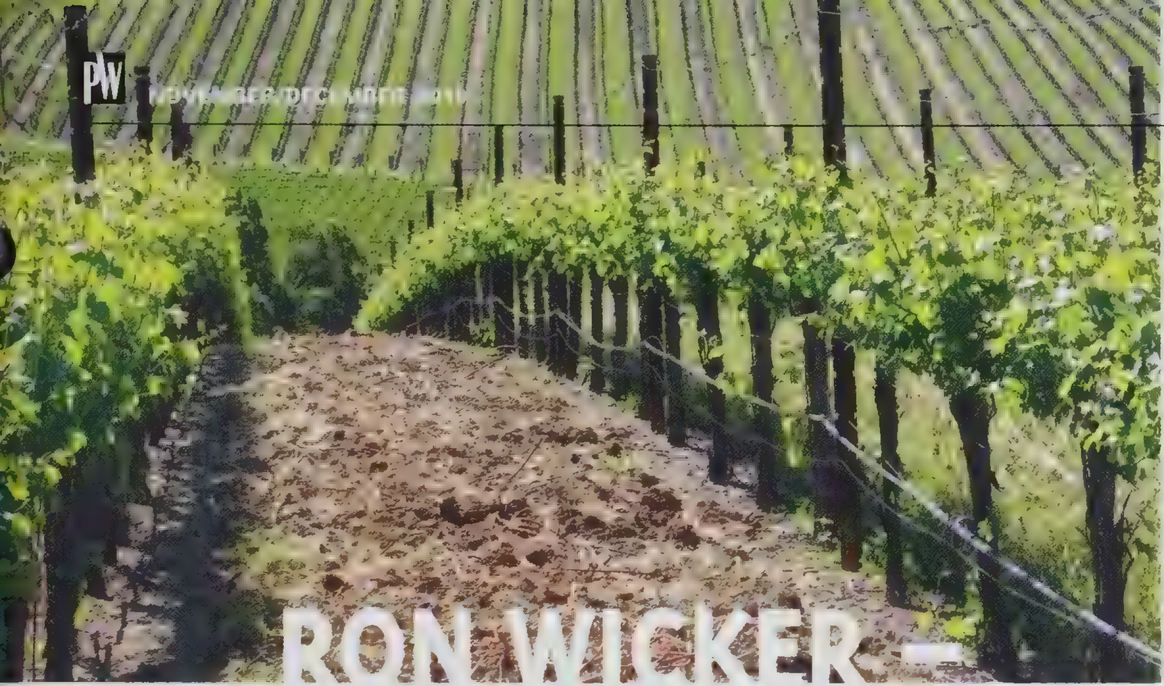

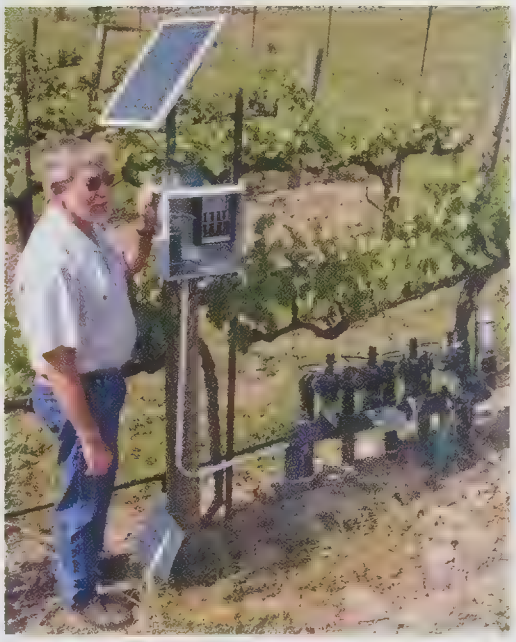

ABOVE: Alternate tractor row mowing and disking on the slopes of Moore Ranch allow better management of the cover crop and vine vigor.

RIGHT: A solar-powered wireless irrigation controller, in an 11-acre Coombsville area vineyard, was designed and built by Ron Wicker and the vineyard owner in 2003 to retrofit an irrigation system with a decreasing well water supply .

RON WICKER –
ENVIRONMENTAL STEWARDSHIP BY NAPA VALLEY GRAPEGROWER

BY Don Neel

Early in his career, Ron Wicker developed a sensitivity to the environment and a passion for the wine grape industry, which became his life's work. Wicker has been chosen as 2010 Napa Valley Grower of the Year by the Napa Valley Grape Growers Association.

From his early days of developing hillside vineyard properties in Napa Valley, many of which still bear his signature today, he learned the importance of working with the environment, reducing chemical inputs, selecting appropriate planting materials for each site, and controlling runoff in order to minimize soil erosion.

Since the 1970s, Ron has fought to maintain the agricultural heritage and uniqueness of Napa Valley, including stints as president of the Napa County Farm Bureau and Napa Valley Grape Growers Association, and founding the Napa Valley Ag Land Preservation Fund in 1983 (now merged into the JL Davies Ag Land Fund).

Dual irrigation lines have been installed on 30 acres of Moore Ranch, allowing targeted irrigation on the various soil types and rootstocks within blocks, resulting in greater uniformity of fruit maturity at harvest.

Built in Washington State, the *Victair* air blast sprayer's high velocity air stream shears water into very small droplet sizes, allowing application rates of 15 to 30 gal/acre of water with excellent coverage. Hydraulically adjustable volutes allow precision placement of the spray material, even on hillside terraces.

Once established, the cover crop of annual grasses and clovers do an excellent job of choking out most noxious broadleaf weeds. The key to success is to delay mowing the vineyard floor until late Spring when the seeds have matured.

Ron Wicker Management is responsible for approximately 300 acres of vineyard on 10 properties in Napa Valley. The two largest vineyards are the 80-acre Moore Ranch vineyard in Conn Valley and a 125-acre vineyard in Jamieson Canyon.

Wicker shared his management practices at the Moore Ranch with ***PWV*** as an example of his commitment to environmental stewardship.

When he took over management of the Moore Ranch vineyard in 1996, the vineyard was clean-tilled, showed signs of severe soil erosion, and had wide variability in vine vigor. Several blocks were still growing on AXR-1 rootstock and needed to be redeveloped.

The vineyard is producing Cabernet Sauvignon and Merlot, divided into 10 blocks (15 irrigation blocks) that include slopes from 5% to 30% managed according to the Napa County Hillside Ordinance.

Wicker has long been a proponent of bringing the winemaking team into the vineyard. "I can recall when, back in the 1970s," Wicker notes, "no one at the winery had ever seen the season's crop until it was delivered to the winery to be crushed."

"Today, we work closely with the buyers of our fruit to assure we are meeting the mutual goals of our relationship. No major operation in the vineyard is started without first conferring with representatives from either Sterling Vineyards or Cakebread Cellars, buyers of the fruit from the 80 acres of grapes. We work together in an attempt to produce reserve quality wine from every ton of fruit."

Each block is managed according to its soils, rootstocks, slope, row direction, and trellis. "We want to ripen fruit to its full potential while not allowing it to be exposed to the damaging effects of direct sun during heat extremes," he adds.

Vineyard floor management includes mowing cover-cropped tractor rows, and disking out alternate tractor rows every other year. Wicker has found that use of an annually reseeding cover crop mix of Blando Brome and Zorro Fescue, with Rose and Crimson Clover, gives him maximum flexibility in managing the vineyard floor. Once established, this mix of annual grasses does a very good job of stabilizing soil erosion and choking out problematic broadleaf weeds.

"The hillside ordinance allows us to rejuvenate (disk out and reseed) every other tractor row in alternating years, if needed," explains Wicker. "In 2010, in an attempt to further our goal toward uniformity, we began, within each row, disking out the cover crop in weaker areas and leaving the cover to be mowed in more vigorous parts of the same row.

"It takes two years to see the full effect of leaving the cover crop, but we are already seeing reduction of vigor in areas where we left the cover crop this year. Vine-row weeds receive one early season application of a pre-emergent herbicide mixed with Roundup® in a narrow band that allows us to maintain 80% ground cover."

Sixty acres in five blocks have been redeveloped by Wicker's personnel, including installation of drain lines two to four feet deep across vine rows to control surface runoff, improve soil drainage, and promote more uniform vine vigor. Several blocks have irrigation systems installed with double drip lines to allow irrigation of weaker vines or different rootstocks within a block to promote uniformity. Four rootstocks have been planted, based on soils and grape variety: 110-R (2/3 of planted acreage), 101-14, 3309, and 5-C.

When 10 acres of vines were removed in 2007, the vines were chipped to become ground cover, and the drip hose, wire, and vine stakes were all recycled. "With increased concern about air quality, we elected to not burn the removed vines, doing our small part to clean up our environment," states Wicker. "The resulting mulch is helping control dust from the vineyard avenues.

"The original 8x12- and 8x10-foot vine spacings have been replaced with higher density plantings of 5x9 (968 vines/acre) and 5x8 (1,089 vines/acre). One 14-acre hillside block has been redeveloped with alternating 8-foot and 4-foot spacing between vine rows to preserve the existing terraced infrastructure and increase vine density to 1,452 vines per acre. The result is 8-foot-wide tractors rows with a 4-foot-wide middle between two vine rows where the ground cover is mowed with weed-eaters."

Target yields are four tons per acre; the recent average is closer to 3.5 tons per acre. A green drop is done at 80% veraison to achieve a balanced maturity at harvest by dropping clusters that are slow to color up. Canopy management includes removal of laterals on the morning side after fruit set, vertical straightening of shoots, and hand separation of clusters to avoid "clumping" of fruit.

A typical two-week long harvest in mid- to late-September is divided into 15 blocks differentiated by fruit maturity, rootstock, clone, or vine vigor.

Vine nutrition status is monitored with annual petiole samples at bloom. Minor adjustments to nutrient needs are applied as foliar additions to the normal spray program. Major additions are added by fertigation through the drip irrigation system.

To control powdery mildew, a growing season will typically see seven spray applications that include rotations of sulfur, DMI, stylet oil, and strobilurin formulations. In a warm area with low mildew pressure, the first application is made at two to six inches of shoot growth, with successive treatments timed according to the Gubler Disease Model Index.

Irrigation needs are determined from soil and vine moisture data provided by Dana Zaccone's GeoVit Vineyard Services, and by visual observation. Beginning in June, Vineyard Manager Matthew Allenson will collect vine moisture data by using a pressure chamber to take up to 16 samples from vines, between 11 AM and 2 PM on the same day every week. These readings are correlated to soil moisture measurements, visual observations, and expected weather conditions to determine water needs for the coming week.

First irrigation is anticipated about July 1. However, in 2008 and 2009 the first irrigation was applied right after flowering.

"If we have enough water available in September and the vines need water, we will continue irrigations into the last week before harvest," notes Wicker. "Our goal is to deliver fruit in good condition with intense flavor profiles. The best pieces of equipment in the vineyard are your own two feet. We have been surprised, for instance, that the pressure chamber showed us 16 or 17 bars in a block of 3309 rootstock, but visual observation told us that the vines did not require water!"

Conclusion

Wicker continues to spend time in the vineyard, and works closely with buyers of the fruit to develop management strategies for optimum quality. Limited water resources, along with a desire to limit chemical, mechanical, and labor inputs each year, keep Wicker and his staff in constant communication with his clients and winery buyers. The result is production of grapes that fit the desired wine styles of each winery, and the maintenance of long-term relationships, both with vineyard owners and grape buyers.

"2010 has been a challenge from the start," says the 2010 Napa Valley Grower of the Year, "but in the end we will be delivering the highest quality fruit possible. When it is all in the tank, this will be a year where patience will have paid off." ■

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BIOPRODUCTS

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MARMANDE FRANCE

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